J. Nelson Spaeth.

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NEW ENGLAND FORESTS IN RETROSPECT *

BY AUSTIN F. HAWES

State Forester of Connecticut

This interesting subject is one about which it is very difficult to secure accurate information. Our early settlers were too busy to spend time writing descriptions of their new country even had they cared to do so. The early histories deal only with the political and theological activities of the people and give little insight into the character of the country or the common pursuits of the people. It was only in the Old World that word pictures of the New World were of interest. So a few travelers who returned to England published their impressions of the New England and in these we get glimpses of the condition of the country.

Among the most interesting of these works are "The New England Rarities," by Josselyn, published in London in 1672, and the "New England Prospect," by William Wood, published in London in 1634.

EARLY IGNORANCE OF TREE NAMES

A good deal of difficulty in reaching any accurate idea of the composition of the original forests arises from the fact that names of trees were more or less loosely used. Thus in the "Humble Petition" of Richard Sackett of New York in 1705 to "The Governor and General Assembly of Her Majesty's Colony of Connecticut in New England," "That, whereas, there is a very great occasion and some necessity of some suitable provision to be made for the furnishing of Her Majesty's Royal Navy and also English Merchant ships with masts, yards, and such Timber and there being divers *Swamps* and *places* of *Pyne* and *Spruce* within this her Majestie's said Colony

* Read at New England Forest Congress, Boston, Dec., 1922.

where are some good suitable trees for that purpose, that are not yet by this Honorable Court given and granted to any Town or particular person," &c.

It is extremely doubtful whether there was ever much spruce in Connecticut except on the mountain tops of the northwestern portion. The petitioner probably refers to hemlock, especially as the latter name does not often appear in the early writings.

Even as late as 1782 the Marquis De Chastellux in his "Travels in North America" tells us: "On everything which wanted an English name they (the Americans) have bestowed only a simple descriptive one; the jay is the blue bird; the cardinal the red bird; every water-bird is a duck. It is the same with respect to their trees; the pine, cypresses, the firs are all comprehended under the general name of pine trees; and if the people characterize any particular tree it is from the use to which it is applied, as the wall-nut, from its serving the construction of wooden houses."

Evidently this member of the French Academy confused our red cedar with the cypress of southern Europe, and his derivation of "walnut" is not at all likely as our American tree was evidently named for its English relative.

In spite of the general ignorance of tree names which is not entirely uncommon even in the 20th century, we have evidence that there were some who distinguished between species as early as 1674. In John Josselyn's "Account of Two Voyages to New England," published in that year, he described in an entertainiing way: the oake, the pine tree, the fir, spruce, hemlock, white cedar, sassafras and walnut. His description of the pine tree following that of oak will serve as an example. He says of it: "That sort which is called Board-pine is the principal—some conceive that the wood called Gopher in Scripture, of which Noah made the Ark, was no other than Pine. The bark thereof is good for ulcers in tender persons that refuse sharp medicines. The turpentine is excellent to heal wounds and cuts, and hath all the properties of Venice Turpentine; the Rosen is as good as Frankincense; the distilled water of green cones taketh away wrinkles in the face being laid on with cloths."

EARLIEST DESCRIPTIONS OF NEW ENGLAND

As Josselyn visited this region in 1638 and again in 1663 his accounts are among the earliest: "Between the mountains are many ample rich and pregnant valleys as ever eye beheld, beset on each side

with variety of goodly Trees, the grass man-high, unmowed, uneaten and uselessly withering . . . in the valleys and swamps which are low grounds and bottoms infinitely thickset with Trees and Bushes of all sorts for the most part others having no shrub or tree growing, but spruse, under the shade whereof you may freely walk two or three miles together; being goodly trees and convenient for masts and sail yards."

Still more interesting is the picture which William Wood leaves us.[1] He settled in Lynn about 1629 and returned to England in 1633. In describing the agricultural opportunities in the new land he gives the following account: "Where the trees grow thinne ther is good fodder to be got amongst the woods." . . . Referring to the salt marshes he says: "These marshes be rich ground and bring plenty of hay, of which the cattle feed and like, as if they were the best upland hay in New England; of which likewise there is great store which growes commonly between the marshes and woods. There be likewise in divers places near the plantations great broad medowes, wherein grow neither shrub nor tree, lying low, in which Plains growes as much grass as may be throwne out with a sithe, thicke and long, as high as a man's middle, some as high as the shoulders, so that a good mower may cut three loads in a day . . . there is so much hay ground in the country as the richest voyagers that shall venture thither, neede not fear want of fodder, tho his heard increase into thousands, there being thousands of acres that yet was never meddled with . . . if he bee one that intends to live on his stocke, to chose the grassie vallies before the woody mountains . . . the woods of New England being accounted better ground (i. e., for farming) than the forests of England or woodland ground or healthy plaines. . . . The next commodity the land affords is good store of woods, and that not only such as may be needful for fewell, but likewise for the building of ships, and houses and mills, and all manner of water work about which wood is needfull. The timber of the country grows straight and tall, some trees being twenty, some thirty foot high before they spread forth their branches; generally the trees be not very thicke, tho there be meny that will serve for mill posts, some being three foote and a half o're. And whereas it is generally conceived that the woods grow so thicke that there is no cleare ground than is hewed out by labour of man; it is nothing so; in many places divers acres being

[1] William Wood's "New England Prospect," London, 1st edition, 1634.

cleare, so that one may ride a hunting in most places of the land, if he will venture himself for being lost; there is no underwood saving in swamps, and low grounds that are wet in which the English get osiers and Hasles and such small wood as is for their use. Of these swamps some be ten, some twenty, some thirty miles long, being preserved by the wetness of the soile wherein they grow; for it being the custom of Indians to bourne the wood in November when the grass is withered and leaves dryed, it consumes all the underwood and rubbish, which otherwise would overgrow the country, making it impassable, and spoil their much affected hunting; so that by this means in those places where the Indians inhabit there is scarce a bush or bramble, or any combersome underwood to bee seene in the more Champion ground. . . . In some places where the Indians dyed of the Plague some fourteen years agoe, is much underwood as in the midway betwixt the Wessaguscus and Plymouth because it hath noth been burned. . . . The Firre and Pine bee trees that grow in many places shooting up exceeding high, especially the Pine; they afford good masts, good boards, Rosin and Turpentine. Out of these pines is gotten the candlewood that is so spoken of, which may serve for a shift among poore folkes; but I cannot commend it for singular good, because it is something sluttish, dropping a pitchie kinde of substance where it stands. Here no doubt might be good done with saw mills; for I have seene of these stately high growne trees, ten miles together, close by the River side, from whence by shipping they might be conveyed to any desired Port."

The foregoing account gives us undoubtedly an accurate description of the country near the coast. We see that before settlement began that there were extensive meadows of grass land in addition to the salt marshes. For the most part the woods of this region were open and free from undergrowth having been frequently burned over by the Indians. In the swamps where these fires did not penetrate the undergrowth was dense.

It is probable that the whole coast had been pretty thickly inhabited by Indians at one-time or another and that the adjacent forests for some miles back from the Coast had suffered from their repeated fires. This cause as well as the light soil probably account for the poor forests of Cape Cod as described by Thoreau in 1865.

Speaking of the inhabitants he says: "When they tell you of large trees that once grew here, you must think of them not as absolutely

large, but large compared with the present generation. Their 'brave old oaks,' of which they speak with so much respect, and which they will point out to you as relics of the primitive forest 100 or 150, ay, for aught they know 200 years old, have a ridiculously dwarfish appearance, which excites a smile in the beholder. The largest and most venerable which they will show you in such a case, are perhaps, not more than 20 or 25 feet high. I was especially amused by the Liliputian old oaks in the south part of Truro." . . .

Describing the Provincetown region: "All accounts agree in affirming that this part of the Cape was comparatively well wooded a century ago. But notwithstanding the great changes which have taken place in these respects, I cannot but think that we must make some allowance for the greenness of the Pilgrims in these matters which caused them to see green. We do not believe that the trees were large or the soil was deep here. . . . They naturally exaggerated the fairness and attractiveness of the land, for they were glad to get any land at all after that anxious voyage. Everything appeared to them of the color of the rose, and had the scent of juniper and sassafras."

While the Indian fires may have affected the forests near the coast, there were undoubtedy great stretches of virgin forests unbroken except by the occasional river meadows.

De Chastellux in returning to Hartford from his visit to General Schuyler at Albany, soon after the Revolution, gives this description of the region of Connecticut long known as the Groen Woods: "This forest is a part of the same chain of mountains I had passed in going to Fishkill by the Litchfield Road, but here the trees are superb; they are firs, but so strong, so straight and lofty, that I doubt whether there are any like them in North America." Fir here probably means hemlock since the author shows elsewhere that he knows the pine.

Many of the early statutes bear evidence of the character of the forests and of the regard of the Colonists and of the British government for them. For example, in the town orders drawn up by seven founders of the town of Woburn, Mass., on December 18, 1640, the fifth order is of special interest:[2] "About timber. That no person shall sell or cut any young oak like to be good timber, under eight inches square, upon forfeiture of five shillings for every such offence."

It is well known that the pitch pine forests of the Connecticut Val-

[2] Woburn Records, Vol. I, p. 2.

ley were originally boxed for tar and turpentine. In 1709 the inhabitants of Hartford voted: "If any persons shall box any pine trees within the bounds of the town of Hartford, either on the Commons, or undivided lands, he shall forfeit to the town's use the sum of five shillings for every tree so improved." This act of restriction probably marks the beginning of the end of this industry, such measures usually coming after a scarcity has begun to be felt.

A few examples of virgin forests have been preserved to us and a study of these proves very interesting as showing the character of our original timber. Professor Fisher has had a few of these areas measured.

One of the most interesting of these stands is an eleven-acre lot at Ashuelot, Mass. This is a mixture of pine and hemlock with a little beech, chestnut, and black birch. The heights range about 115 feet with one tree 120 feet high and 39 inches in diameter; one 133 feet and 35 inches in diameter and one 142 feet and 33 inches in diameter. The stand in one portion of this forest scaled at the rate of 84,000 board feet per acre of which pine formed 80 per cent and hemlock 20 per cent. In another part of the same lot the total stand, including 10,000 feet of dead timber, was 72,500 board feet. In this plot 59 per cent was pine; 40 per cent hemlock, and 1 per cent beech.

In Cornwall, Conn., is a twenty-acre stand of mature timber with trees ranging from 20 to 33 inches in diameter, and 100 to 140 feet in height. Many of these trees contain from 1,500 to 2,000 board feet of lumber and the total stand averages 67,000 feet per acre. About 80 per cent of the timber is white pine, about 18 per cent hemlock, and 2 per cent chestnut and oak.

A few years ago the last remaining large tract of virgin timber in Connecticut was cut in Colebrook. This was about two hundred acres of timber which had been preserved by one family. The stand was made up chiefly of large hemlocks, yellow birch, sugar maple, and beech and red oak, but there were occasional specimens of white pine up to 3 feet in diameter, splendid straight black cherry fully 2 feet in diameter, and considerable basswood and white ash and chestnut As will be seen this was a transition type with representatives of both the northern and southern forest.

To summarize the evidence of the early records and the studies which have been made in our remaining stands, we may say that the Connecticut Valley from Hartford north to Wells River was covered with a pine forest similar to the plat at Ashuelot. This forest type

undoubtedly extended in a more or less broken form through eastern Massachusetts and southern New Hampshire and Maine. A similar type covered the Champlain valley in Vermont. In the drier portions there was a mixture of pitch pine instead of hemlock. The mature trees varied in height from 120 to 150 feet, and in diameter from 30 to 50 inches. The stand varied from 25 to 75 thousand feet per acre, and probably occasionally 100,000 feet.

The mountain ranges of Vermont and New Hampshire and the northern half of Maine were covered with spruce forests which gave them a dark green appearance like the Black Forest of Germany. On the lower slopes the spruce was mixed with hardwoods: beech, birch and maple, with an occasional pine and hemlock. On the upper slopes balsam fir appeared. The stand in these spruce forests varied from ten to forty thousand feet per acre, except on the upper slopes where it gradually diminished to a few cords of scrub growth.

Between the pine forest of the valley and the spruce forest of the mountains was a hardwood belt composed mostly of maple, yellow birch, and beech, but with occasional pine, hemlock, spruce, basswood, ash, and paper birch. In southern Vermont, New Hampshire and Maine, western Massachusetts and northern Connecticut, the southern hardwoods, oak and chestnut, also formed a part of the mixture. The stand in these hardwoods probably varied from five to twenty-five thousand feet per acre.

Throughout most of Connecticut, Rhode Island, and eastern Massachusetts the southern hardwood type extended, consisting of red, white, scarlet, and chestnut oak, chestnut, black and yellow birch, tulip, hickory, and ash. The trees were large and straight like those of the Appalachian forests of our day. The stand probably varied from five to twenty thousand feet per acre.

In all of the original forests there were openings; swamps and meadows made by beaver dams; areas burned by Indian fires especially near the sea coast and lake shores; and windfalls and rocky mountain summits. These openings would, of course, considerably reduce the average stand for the whole area so that the government has estimated the original stand for the 39 million acres of New England at 400 billion feet.

PERIOD OF AGRICULTURAL EXTENSION 1620-1820

Such was New England when the first settlers pushed into the interior.

For more than two centuries after the settlement at Plymouth the development of new farm regions and the consequent removal of the forest continued uninterrupted.

It is probable that the first sawmill in New England, and very likely in America, was built at Agamentico, later known as York, Maine, in 1623, or the following year, under the direction of Sir Ferdinando Gorges.[3] It is altogether probable that all the earliest sawmills used here were of Scandinavian origin. They were all equipped with the up-and-down saw and were dependent upon water power. After about 1650 the sawmill almost immediately followed settlement in any portion of New England, usually in connection with the grist mill, and the location of a water power often determined the location of the settlement. The right to erect and operate sawmills was in the early days granted by town meetings, and it is evident that the people were wide awake to the benefit of having a local sawmill. The clearing of land for farming purposes kept the mills supplied with logs so that lumbering as a separate industry probably did not exist to any extent before the Revolution.

A picture of land clearing as it was carried on at the time of his travels is given by De Chastellux.[4]

Near Farmington, Conn., a new spectacle presented itself: "This was the work of a single man, who in the space of a year had cut down several arpents of wood, and had built himself a house in the middle of a pretty extensive territory he had already cleared. I saw for the first time what I have since observed a hundred times; for in fact whatever mountains I have climbed, whatever forests I have traversed, whatever by-paths I have followed I have never travelled three miles without meeting with a new settlement either beginning to take form or already in cultivation. The following is the manner of proceeding in these improvements or new settlements. Any man who is able to procure a capital of 5 or 6 livres of our money, or about £25 sterling and who has strength and inclination to work may go into the woods and purchase a portion of 150 or 200 acres of land which seldom costs him more than a dollar or four shillings and sixpence an acre, a small portion of which he pays in ready money. There he conducts a cow, some pigs, or a full sow, and two different horses which do not cost him more than four guineas each. To these precautions he

[3] See History of Lumber Industry of America, by Defebaugh.

[4] Travels in North America 1780, '81, and '82, by Marquis De Chastellux.

adds that of having a provision of flour and cyder." After cutting the small trees he "boldly attacks those immense oaks, or pines . . . he strips them of their bark, or lays them open all round with the axe. These trees, mortally wounded, are the next spring robbed of their honors. . . . The ground is cleared: the air and sun begin to operate upon that earth which is wholly formed of rotten vegetables and teems with latent principles of production. . . . Four years ago one might have travelled ten miles in the woods I traversed without seeing a single habitation."

In the early clearings of the more remote sections great quantities of potash and pearl ash were made from the trees that were burned in immense fires and which sometimes lighted up the sky for weeks at a time. This material was shipped in barrels in long trains of carts hauled by oxen over rough roads to Boston and Montreal and exchanged for materials required by settlers. In many cases it served as the only cash crop for a year or more after settlement.

Commerce and ship building were among the first industries of New England. An early record states that in 1623 a ship of a hundred and forty tons, called the Anne, was freighted at Plymouth and returned to England with a cargo consisting of clapboards with a few beaver skins and other furs. These clapboards were oak staves for wine casks and had a good sale in London. The settlers of the West Indies also depended upon New England for their supply of barrels and boxes in which to export their molasses and sugar. One of the chief industries of our coast towns was salted fish for export and for use on merchantmen. This industry required a great many barrels for packing.

As early as 1629 there were six shipwrights at work in Boston, and on July 4, 1631, Gov. John Winthrop launched at Mystic, now Somerville, a vessel of sixty tons, called the "Blessing of the Bay." It was the first vessel built in the Massachusetts Bay Colony and demonstrated the excellence of New England timber for this purpose. Medford, Marblehead, and Salem soon began to build ships. Gradually all the sea coast settlements from Maine to Connecticut took up the industry.

The best white pine was used for masts and became so much an object of solicitation on the part of the British government that many trees were marked with the King's arrow by his officers to be reserved for the navy. A report of one of these Surveyors General tells of bringing several masts down the Connecticut river from above the

Great Falls (now Bellows Falls). One mast was 3 feet 11 inches in diameter and 97 feet in length; and there were more that were 4 feet in diameter and about 90 feet in length.

The English government undoubtedly appreciated her new-found American possessions more for these great forest resources than for their possibilities for colonization. There were times during the ascendency of the Dutch and French fleets when the English navy was in sore straits for timber as is evidenced by Samuel Pepy's famous diary:

Dec. 2, 1666. . . . "I hear more ill news still: that all our New England fleets, which went out lately, are put back a third time by foul weather, and dispersed some to one port and some to another; and their convoys also to Plymouth; and whether any of them be lost or not we do not know. This added to all the rest do lay us flat in our hopes and courages, everybody prophesying destruction to the nation.

Dec. 3, 1666. "At noon home, more cheerful than I have been a good while, to hear that for certain the Scotch rebels are all routed: . . . There is also the very good news come of four New England ships come home safe to Falmouth with masts for the King; which is a blessing mighty unexpected, and without which, if for nothing else, we must have failed the next year."

The settlement of Massachusetts was so rapid that most of the lumber was required for domestic purposes, but a great exporting lumber business grew up in Maine at an early date. By 1682 there were twenty-four mills in the territory now known as Maine. The most important lumber shipping post of the colonies during the 17th century was that of the Piscataquis River. During the ten months ending April 12, 1681, according to statements made by the King's Council to the Lords of Trade, there were entered at that port "22 ships, 18 ketches, 2 barkes, one scallop, and one fly boat—in all 47." . . . "The trade of the province is in masts, planks and staves and all other lumber." Pine for masts and oak and tamarack for ship building were cut not only on the Piscataquis but the St. Croix and other rivers of Maine. Later the Penobscot became the most important lumber stream.

An interesting insight into the English merchant's attitude toward American timber is given by the following letter written in London in 1767.[5]

[5] Letter from Richard Jackson to Jonathan Trumbull, Inner Temple, 19 Oct., 1767, published in the Collection of Conn. Hist. Society, Vol. XIX, Hfd., 1921.

"I know that casks at present are used for wheat manufactured into flour in America, but I would advise sending unground wheat in casks, too, unless it be thought better, as perhaps it would be, to grind all the wheat first and send it in flour and this business I could wish to be carried on in your Colony without the intervention of New York.

"But potash seems particularly to demand the attention as this commodity in no degree interferes with Great Britain and will certainly if its use here can be established in preference to the foreign be a permanent branch of trade, the Americans seem to want some advice on this head with respect to the making this commodity: 2 members of our Society have tried Experiments on their Potash with the view of discovering how it may be improved.

"But I have greater hopes still from the Effects of our late Bounty on oak and pine timber boards. I flatter myself that nothing but a little acquaintance with the manner in which this trade is here carried on and the kinds of Timber we use, and a little attention to Scantlings required in this Country are necessary besides that caution which Americans ought to use in *chusing,* felling and cutting out even what they build with themselves, for the establishment of trade. Hitherto I am told it has been the Practice to fell the first Trees that come at hand at any Season of ye year and immediately saw them out and convert the Board and Plank to building Houses or Ships. Every sort of Oak is felled without distinction though the White Oak and Rock Oak are only fit to bear the weather. Besides America is covered with a forest, a very small part of which has ever been cleared since the Deluge."

For us who have hardly seen a mature oak or pine in New England the remainder of the letter is equally interesting:

"No wonder that the greater part of your Trees are superannuated. . . . A tree retains almost all its Beauty many years, perhaps a century, after it has attained its Perfection without apparent Decay, and yet grows really worse for many Uses every Day. . . . Were your Oak and Pine Timber especially the former chosen before it loses its strength and is in full Vigour felled only in Winter, carefully sawn of uniform Scantling from one End to ye other (whereas I am told the New England Board is frequently 5 or 6 different thicknesses) and the Board or square Timber seasoned perhaps floated after it is sawn the reputation of American Lumber might be retreived in England and ye Produce of it become a principal return for European Goods. It is incredible what quantities of Oak, Fir, and Pine

Plank Board and Timber are brought thither from Norway, Sweden, Russia, Prussia and Germany. . . . Our own stock is so far exhausted as to bear no proportion to our Consumption. The Bounty given by Parliament I am told will go a good way in paying the freight and a ship load of this Timber ballasted with Iron may ship and Cargo be all readily turned into money, were but ye credit of American Timber once established as I think the Care of a Colony sh'd be employed to so: in case individuals do not think it worth while."

The lumber industries of the Colonies steadily grew up to the time of the Revolution, and in fact was not long interrupted by the war. In 1770 the export of masts, boards, staves, etc., from New England was valued at £45,000; ships about 70 sail, at £49,000; and potash to the amount of 8,000 barrels at £20,000. The trade in lumber was largely with the West Indies, Madeira and the Canaries.

In 1807 the importation of timber to Great Britain from the United States amounted to $1,302,980, of which the white pine formed about one-fifth. This sold in Liverpool at that time at about $20 per thousand.

In 1817 the lumber exports of the United States, including "boards, staves, shingles, hoops, hewn timber, masts and spars," were valued at $3,196,000. Lumber had fourth place among our national exports, following cotton, wheat flour and biscuit, and tobacco. The lumber was cut chiefly in the forests of Maine and the low country of the Carolinas.

By 1816 there was owned in United States 1,372,218 tons of shipping.[6] Of this 41 per cent was owned in New England, and it is probable that at least half of it was built here.

The use of wood for fuel was tremendous from the first. So long as houses were heated entirely by fireplaces which was well into the beginning of the last century there was a great waste of fuel. It was not uncommon for an establishment to require from 30 to 40 cords a year and the minister was usualy paid in part in cordwood which was cut by his parishioners in cutting bees. President Dwight in his travels speaks of the system of cutting cordwood on a short coppice rotation in the early 19th century, and undoubtedly the fuel shortage seemed imminent before the introduction of coal.

The great iron producing region of the country up to the early part of the last century was in western Massachusetts and Connecticut.

[6] Morse's School Geography on An Improved Plan. New York, 1828.

For two centuries the ore of these mines was smelted with charcoal made from the wood grown on the surrounding hills. At length the industry grew to such proportions that the wood problem was a difficult one.

In the preceding pages we have tried to show how intimately was the life of the people connected with the forest during the first two centuries of New England settlement. With the exception of Maine and the mountainous sections of Vermont and New Hampshire, the whole country was a continuous prosperous agricultural settlement. In many regions now wilderness the splendid colonial houses stood at that time near enough together so that an attractive community life was possible. These houses with their attached barns and sheds and miles of rail fences; the stately churches at crossroads; the stores, town halls and other numerous village buildings were all evidence of the contribution of the New England virgin forests to the life of the people. The population of New England was 1,659,854 in 1820. We may estimate that there were at least 237,000 dwellings.[7] A description of Boston in 1839 says: "In the more ancient parts of the city, the streets are still narrow and crooked, and a great proportion of the buildings are wood." [8] Practically all of the frame houses of New England at that time had been built of native lumber.

PERIOD OF THE RISE AND FALL OF THE NEW ENGLAND LUMBER INDUSTRY, 1820-1880

By 1820 new conditions were bringing about a decided change, agricultural development had reached its maximum in southern New England. In Connecticut not more than one-quarter of the area remained in forest according to Harper,[9] and the original pine was practically gone.

The cotton industry and other lines of manufacturing were being developed on the water powers, and were already drawing people from the hill towns into the valleys. Migration to the middle west was in full swing. The invention of farm machinery was soon to make the cultivation of the rough, rocky lots impracticable. Steam

[7] The Census of 1850 shows that there was one dwelling for every 5.9 persons in United States.

[8] Lives of Presidents of United States, by Robert W. Lincoln, Brattleboro.

[9] Changes in the Forest Area of New England in Three Centuries. R. M. Harper, JOURNAL OF FORESTRY, 1918.

locomotion was another factor. This at first depended upon wood and threatened to aggravate the already serious fuel problem.

The rapid growth of the cities and towns in the south made an ever increasing demand upon these remaining forests further north. The production of lumber became less and less a part of farm clearing. It was developing into a great national independent industry. Large sawmills were built on all the important rivers. Big camps were established in the hills and mountains and great gangs of transient labor cut the trees, hauled the logs on sleds to the water's edge in the winter, and drove them down stream to the mills upon the breaking up of the ice in the spring. River driving became a highly developed New England art, and the life of the lumber camps, then filled mostly with American labor formed the topic of many stories.

By 1850 the lumber industry of southern and central Maine had reached its peak and the larger spruce trees of the mountains were taken by the lumbermen as well as the pine which was becoming scarce. Southern New England was undoubtedly beginning to import softwood lumber from the Adirondacks and Pennsylvania, but its own hardwood forests were still supplying the local needs. Although New England had ceased to be an important factor in the national lumber supply by 1880 the recuperative power of its woodlands was so great that second growth furnished an increasingly large proportion of the timber cut. The maximum cut was therefore not reached until 1907.

PERIOD OF FOREST DEVASTATION, 1880-1923

Undoubtedly it was the depletion of the New England timber supplies and the gradual shifting of the lumber industry to the Lake States which led to the first national consideration of timber supplies in the Census of 1880, conducted by Professor Sargeant. This census report shows that the lumber cut of New England in 1880 was 1,460,005,000 board feet.

Although forest destruction had been characteristic of New England from the first, it had not, up to this time, resulted in great areas of devastated lands as we find them everywhere today. In the early times the cleared lands had been improved for farm purposes. The later lumbering had seldom been clean cutting. It was usually a culling of the larger and better trees and much was left to grow. Two new factors were now rapidly changing this condition.

In southern New England the portable steam sawmill was moved from one lot to another which had hitherto escaped because of its inaccessibility; or which had grown up on fields long since abandoned. Since it was only temporarily in one location it was considered better economy to cut clean, and the evil practice grew up of selling lots with the standing timber to the mill men for a lump sum. This practice has resulted in the devastation of thousands of acres in southern New England especially for the production of railroad ties and cheap grades of lumber.

In the northern forests a still more destructive agency had been at work. The pulp and paper industry which has thrived on our spruce forests has been one of the chief assets of Maine during the past half century. Trees which were considered too small for lumber were all right for pulp, and land, which had been culled long ago of its best trees, was now cut clean for pulp wood. More recently the development of soda pulp mills has opened a market for poplar.

Objection is often raised to the use of the word "devastation" as applied to New England lumber and pulp operations. It is true that our climate is so favorable to tree growth that even after the most wretched treatment some kind of growth will eventually reassert itself, and we therefore do not have the permanent evidence of devastation such as exists in China. This, however, is small excuse for our neglect. Similarly we should find little comfort in transfering the blame for devastation to forest fires and insects. Almost every large fire has started and gained momentum in the slash left by loggers; and most insect devastation has gained headway in forests which had been so altered by man as to provide an especially good breeding condition.

Although the census of 1881 guessed the remaining stand of pine at about one-half billion feet and that of spruce at about seven billion feet, fully six times these amounts have been removed in the interval since. In spite of this discrepancy the Forest Service estimated in 1920 that the forests of New England now contain nearly ten billion feet of white pine, and about twice as much spruce. It is evident that the earlier estimate entirely failed to take into consideration the vast amount of small spruce adapted for pulp. In the same way the pine estimates must have been entirely based on virgin supplies and failed to take into account the large acreage of second growth in Southern Maine, New Hampshire and Central Massachusetts, which

has supplied vast quantities of material for the manufacture of boxes and matches.

The very fact that we have been able to go on cutting lumber after the period when it was expected that it would be exhausted has brought about a dangerous and unwarranted feeling of optimism. We must remember, however, that we are now using grades and sizes which would not have been considered forty years ago. Our estimates today have taken this changed market condition into consideration. It will not be possible to rub the Aladdin's lamp again and find a large amount of unestimated timber.

More recently new industries have developed which are using the northern hardwoods—birch, maple and beech. Furniture, refrigerators, coffins, dairy implements and excelsior are a few of the present products of our forests.

In the course of the three centuries which have passed the virgin forest has been reduced from 95 to 5 per cent of the total area of New England. Most of the area has been either severely culled or has been cut clean and is now covered with immature second growth. The original stand of timber estimated at 400 billion feet has dwindled to about one-eighth of that amount. The lumber industry as a producer of building material has gone, for we are now building almost entirely with southern pine and Pacific Coast timber. In this retrospect there is no place for a look ahead. It is sufficient to point out that nearly half of southern New England is now classed as woodland although covered with a very poor growth; that two-thirds of New Hampshire is so classed and three-quarters of Maine. Never in the history of New England has there been as much waste land as at present and never has there been so great a need for the systematic raising of timber.

FIFTEEN YEARS OF FORESTRY[1]

By Ralph C. Hawley

More than 10,000 acres of land on the watersheds of reservoirs furnishing water to New Haven, Connecticut, and adjoining communities are owned by the New Haven Water Company. These lands lie on three sides of the city of New Haven, comprising eight principal tracts and numerous small areas, all within a distance of 14 miles from the center of the city. The location makes possible management of fairly intensive character. The property has been built up through the acquisition of lands which in most instances were or had been in farm ownership.

Purchase of land is still in progress as desirable tracts come onto the market. Land area occasionally is reduced as new reservoirs are built or as the dams of old reservoirs are raised. Two principles have been applied in acquiring land; in some cases the entire watersheds of streams have been taken over: in most cases belts of varying width adjoining lakes, streams and tunnel lines are obtained. Application of the latter principle has led to the elongated and irregular shape of many of the tracts.

The New Haven Water Company finds its interest in forests and forestry because of the protective and scenic values inherent to a properly managed forest cover. Financial returns on lands which must be owned for protective purposes are desirable but subordinate to the maintenance of the best protective cover. Better streamflow and sanitary cleanliness result as a consequence of forest protection. Forestry offers the best means compatible with protection for permanent and increasing financial returns from these lands. As a matter of fact, protection and profit are not necessarily antagonistic and can both be secured in the majority of instances.

Many private water companies and municipal water boards have engaged in forest work. Few, if any, have equalled the New Haven Water Company in a sensible and business-like blending of the protective and commercial aspects.

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[1] Paper read at the winter meeting of the New England Section, Society of American Foresters, February 23, 1923, at New Haven, Connecticut.

The financial position of the company makes possible all forest investments which the protection of the watersheds demands or the ultimate profit to be derived from growing trees warrants.

Forestry has been practiced since 1907 and on one tract since 1900. A 15-year period of actual work has elapsed during which methods of procedure have been developed and technical data gathered which may be of interest briefly to review.

In 1907 arrangement was made whereby a representative of the Yale School of Forestry acted as forester for the New Haven Water Company. In this way the property has been made to serve the purposes of a school forest as a demonstration ground for students and as a laboratory for research in silviculture.

The entire property is thrown into several divisions based on separation into the principal watersheds. Eventually each one of these divisions may be considered a separate working circle, but at present only one working circle is made of the entire area.

TABLE 1.—*Classification of Lands Into Types and Age Classes.*

Age in years	Type								
	Hardwood	Hemlock	Pine	Old Field	Agricultural	Open Swamp	Administrative	Barren	Total
	Area in acres								
1–10	954	1	1,514		1,210	123	76	6	1,415
11–20	1,798		260						2,469
21–30	885								2,058
31–40	950	2	3						885
41–50	304	2							955
51–60	388	4							306
61–70	28	11							392
71–80	22	104							39
Over 80	21	1	31						126
Density of stocking 0–.3				284					53
.4–.7				243					284
.8–1.0				253					243
									253
Total	5,350	125	1,808	780	1,210	123	76	6	9,478

Each division is divided into compartments. Highways are used as compartment boundaries and prove very satisfactory because the country is well gridironed by such roads. The area within each compartment is subdivided into subcompartments, each containing only one type and one age class. These divisions are the ultimate units of management. Abrupt changes in type and age class require the use in some cases of subcompartments less than an acre in size. The types and age classes used are shown in Table 1, which gives for the portion of the tract mapped and classified the areas in the various types and age classes.

In the old field type a classification based on density of stocking is substituted for age because of the importance which the degree of stocking exerts in the management of this particular type.

Property maps on the scale of 200 or 400 feet to the inch based on transit surveys are prepared by the company's engineering force. Upon these base maps the compartment, subcompartment, type, and age class divisions are indicated. A descriptive card is prepared and filed for each subcompartment. When wood or timber is cut or other operations undertaken the amount cut and a statement of the operation is noted on the descriptive card applying to that subcompartment. Complete costs are not kept separately for each subcompartment.

TABLE 2.—*Annual Cut of Forest Products.*

Year	Product	
	Cordwood, cords	Lumber, poles, piles, ties, etc., feet board measure
1908	1,250	35,000
1909	1,500	80,000
1910	1,000	110,000
1911	2,000	295,000
1912	1,200	600,000
1913	675	200,000
1914	2,125	525,000
1915	2,000	1,035,000
1916	350	145,000
1917	300	250,000
1918	500	325,000
1919	1,200	400,000
1920	1,300	60,000
1921	2,300	300,000
1922	1,400	300,000
Total	19,100	4,660,000
Average per year	1,273	310,667

All products combined expressed in cords, 1,790.

Eventually a soil classification in five quality classes (three upland and two lowland qualities) will be shown on the maps.

A sustained annual yield is desired. This is calculated in cords (lumber, ties, piles, etc., being converted into cords for this purpose) for the property as a whole and not for the individual divisions. Only the hardwood and hemlock type is included in the calculations. The annual cut during the period since 1907 is given in Table 2. The fluctuation from year to year is due primarily to cuttings forced by chestnut blight injury or to market conditions.

Figures for the mean annual growth per acre as given in Bull. 96, Sprout Hardwoods in Connecticut, and as derived from various plots and cutting areas furnish the basis for the estimate of annual growth. This is placed at the present time at 2,700 cords per year for the 5,475 acres of the hardwood and hemlock types. The past cut is thus very conservative as contrasted to the growth. In fixing the allowed annual cut consideration was given to the facts that the age class distribution is faulty, the upper age classes being deficient and the growing stock too low. The allowed annual cut for the next ten years is placed at 2,000 cords.

More elaborate methods of calculating growth and annual cut have not been needed in the past and will not be for the next few years.

The extermination of the chestnut greatly decreased the productive power of the forest areas and made serious inroads upon the growing stock.

In selling wood and timber various methods are employed. Timber usually is sold on the stump to local portable mill operators either for a lump sum or by the thousand feet board measure or by the piece in the case of poles, piles, etc. Occasionally other arrangements by which the operator receives a share of the profit have been used.

Cordwood is sold on the stump, and also is frequently cut by the company. Such wood may be sold wholesale on the lot or cut up and retailed in the city. Development of cordwood sales, particularly of material to be removed in thinnings, is the key to intensive forestry in Connecticut. It presents a problem which even in the thickly settled region adjacent to New Haven still lacks a complete solution.

Three silvicultural problems of major importance are constantly under consideration.

(*a*) Establishment and management of coniferous plantations. Much of the agricultural land owned by the company is so located with respect to water supplies that ordinary farm operations cannot be

safely pursued. Hence this agricultural land and old fields are planted to secure best protection and ultimate financial returns.

The climate favors pines rather than spruces. White and red pines have been used as the principal species for forest planting.

Three-year-old transplants are the standard stock and are planted by the hole method. Cost of growing the trees and planting them has averaged $12.72 per acre (1,200 trees). The heavy grass sod found on the average planting site requires transplants rather than seedling stock.

Care and maintenance of plantations, including among others such items as cleanings, removal or weeviled tops, construction and maintenance of fire lines to protect plantations, has called for an average annual expenditure of 80 cents per acre per year.

These plantations are made on land which, if left alone, will revert to hardwoods. Pine unaided cannot maintain itself against the hardwoods. How and to what extent under management a pure pine type can be maintained in this region is yet unknown.

(*b*) Growth and management of the hardwood type. The loss of chestnut, formerly the chief species in this type, rendered worthless much early work in reference to hardwood stands. Particularly, yield of hardwood stands lacking chestnut requires investigation.

The shelterwood method of reproduction on a 70 or 80-year rotation requiring at least one reproduction cutting before the final cutting is thought on the better qualities of soils to be the best way of establishing a new stand. On the wetter and poorer soil qualities and in inaccessible locations where thinnings are impracticable clear cutting with sprout reproduction on a 50 to 80-year rotation is practiced.

(*c*) Extension of the hemlock type—its growth and management. Hemlock is the one conifer native to this region of commercial value which is able to compete successfully with the hardwoods. Observations lead to the conclusion that growth and yield of hemlock stands is better than commonly thought. For these reasons hemlock is being encouraged in all cuttings and more definite information is being sought as to its yield and best methods of treatment.

Research is in progress to secure facts for solving various phases of these three major problems which are paramount through the Connecticut hardwood region.

Fire protection of course is recognized as fundamental. During the 15-year period 44.7 acres of pine plantations and 530 acres in other types have been burned over. In the whole, considering the hazard

in the region, this is not a bad record. Unfortunately 1922 was the worst year of the entire period and it is evident the protection system must be strengthened.

Watchmen report all fires to the central office and fight them. Additional men are sent out from headquarters in the city with chemical extinguishers, and other tools, if the fires are too big for the watchmen to handle.

Serious injury to white pine from blister rust is not apprehended because wild ribes are rare in the region around New Haven.

During the past 15-year period expenses for establishing and caring for 1,800 acres of plantations have been heavy. The funds for the plantations have come from the proceeds of wood and timber sales in the hardwood type. Up to date total receipts from such sales have exceeded all expenses for forestry work. This relation can be continued. Planting of open lands is likely to progress actively for another decade. Meanwhile, however, the growing stock in the hardwood type is increasing and will soon make possible a larger annual cut.

THE FUEL WOOD SITUATION AND HOW IT AFFECTS THE PRACTICE OF SILVICULTURE[1]

By F. W. Besley

State Forester, Maryland

The scarcity of coal and its increasing cost in recent years have given great impetus to the use of wood for fuel. The fuel situation during the war put this question prominently before the public, and by force of circumstances, the substitution of wood for coal was brought about in an unprecedented manner.

While there has been some reaction since the war urge has ceased to be a factor, the recent coal strike and the high price of coal, which is likely to continue, have tended to promote a continued use of wood for fuel as a substitute for coal. It is getting increasingly difficult to answer with any satisfaction the question: Why use coal, an irreplacable product, when wood is going to waste in the forests of almost every community? It is possible and perhaps may be profitable for us to consider some of the deductions that may be drawn from a consideration of this subject, as presented in the past few years.

There is an abundance of wood suitable for fuel purposes.

Nearly every acre of forest land has some dead, down, or standing tree growth suitable only for fire-wood. It is estimated that about 600,000,000 cords of wood can be cut from the forests of the Eastern United States by simply utilizing waste wood and poorer grade material that would be a permanent improvement to the forest to remove. There is a wooded area of nearly 150,000,000 acres on the farms in the Eastern United States, and on this land fuel wood is an important product. With the exception of some parts of the Middle West, there is an abundance of wood within reach of every community, and there can be no real danger of a fuel famine. The willingness of the American public to pay for luxuries is accountable to a considerable extent for the use of coal where wood would serve just as well, at lower cost. In this connection, we may note the farmer who hauls coal five or ten miles from town, to which it has been delivered by rail shipment from the mines three hundred or more miles away, when wood is going to waste on his farm.

[1] Presented at the annual meeting of the Society, at Boston, December 29, 1922.

The use of wood for fuel is entirely practicable, where long hauls by rails are not required.

Wood is too bulky to ship any considerable distance, but where it does not have to be hauled more than ten miles it can compete with coal. To produce the same amount of heat it takes two times the weight and four or five times the bulk of dry wood, as compared with hard coal. It is evident, therefore, that the transportation costs on wood are very high as compared with coal. Only under exceptional conditions is it practicable to ship wood by rail. On the other hand, in this era of good roads, it is often possible to deliver wood, by truck, as much as twenty miles and make a fair profit.

Wood cannot replace coal in large cities, because of the lack of storage space, inconvenience in handling, and greater cost of transportation, making its use as expensive as coal.

The city dwellers, who are accustomed to burning coal, find it impracticable to substitute wood, and an outlet for the surplus fuel wood cannot be looked for in this direction. It would require an entire change in the method of heating. It takes too much room to store wood, it is too difficult to handle, and it does not keep the steady, even fire that is required in city houses. Furthermore, the cities are farther removed from the wood supply, greatly increasing transportation costs.

This does not mean, however, that large quantities of wood will not continue to be used by the poorer classes in cities for domestic purposes in the kitchen stoves and by the well-to-do in the open fires. But such use is not likely to increase to any great extent.

The amount of wood used in the rural communities and smaller towns will undoubtedly increase.

It is in small towns and rural communities that we may reasonably expect to see a greatly increased use of wood for fuel. The air-tight stoves and pipeless furnaces now so common through rural sections have overcome many of the difficulties in burning wood economically. The successful use of wood is largely dependent upon the proper control of the draft. Wood has the potential heating value, but the maximum can only be obtained by a proper control of the fire. A cord of good, dry hardwood, weighing approximately 4,000 pounds is equivalent to a ton of hard coal in heat units. A cord of wood in rural communities costs less than half as much as a ton of coal—an apparent saving of, at least, 50 per cent.

Wood is not a suitable fuel for industrial plants, except where it is a by-product of the operation of such plants.

Soft coal is the fuel almost universally used for steaming purposes in industrial plants. It is not likely that wood will ever compete with coal for such uses, except in emergencies, such as occurred in some parts of the country during the war period. An exception should be noted in the case of saw-mills and wood-working plants, where large quantities of fuel-wood form a by-product of the operations. The excess of such fuel wood, over and above the amount required to operate the plant, is often converted into stove wood, and sold for domestic uses in the community, or in some cases, the surplus is sold to other industrial plants in the vicinity for firing their boilers.

The cutting of fuel wood offers large opportunity for forest improvement.

Throughout coniferous areas from Maine to Texas, there is the ever-present danger that the advance growth of hardwoods will prevent a satisfactory reproduction of pine after cutting. Pine, being the more desirable, because the more valuable as a forest crop, needs either release or, at best, an equal chance by removing hardwoods that are too small or not otherwise suitable for saw-timber. Here the cutting of hardwoods for fuel often furnishes the solution of the problem and turns what threatens to be a failure to reasonable success.

According to Government statistics, approximately 100,000,000 cords of fuel wood are consumed annually in the United States, of which about 83,000,000 cords are used on farms. This is equivalent to about 8,500,000,000 cubic feet and represents a considerable part of the total wood use of the nation.

Most of the fuel wood comes from small holdings to supply the needs of the farm, or to salvage the tops and lops left after logging operations. In the first instance, the amount cut on any one holding is comparatively small, and if the trees are properly selected and well distributed may result in the improvement of the forest. In the second instances, where the cutting of fuel wood utilizes the debris in the woods, this may result in the removing of serious fire danger, reducing insect damage, and greatly improving the appearance of the woodland. The average woodland has steadily depreciated both in quantity and quality of the growing stock, the result of repeated cutting of the better trees, thereby increasing the proportion of the poorer kinds. This has been due, largely, to the lack of a market and unprofitable

prices for poorer grade material. Now, with the better grades practically gone, the poorer grades becoming good grades, and a market rapidly developing for nearly all classes of forest material, even fire-wood, at a profit, the way seems open for the practice of some real silviculture.

Taking the eastern third of the United States, including the New England States, the Middle and South Atlantic States, 37 per cent of the farm acreage is in woodland, while but 52 per cent is improved farmland, as shown by the 1920 census figures. I am using farm owners, not only for the reason that as a class they are the largest users of wood and the largest owners of woodland of any other class in the Eastern United States, but for the reason that they are the ones who produce and use the greatest amount of fuel wood.

The farmer, who is the largest user of wood, and who is in the best position to practice forestry of any woodland owner, needs especial encouragement and help at this time. His holdings are relatively small, he is on the ground and can give intensive management. He has the labor and teams for woods-work available at a season when such work can be done to best advantage. The needs of the farm are usually satisfied with lower grade material that can be taken out in the nature of thinnings and improvement cuttings for fire-wood and building purposes, leaving the more promising growth for a future timber crop. I am not unmindful of the fact that the farmer is difficult to influence in the adoption of improved methods of forest management. He has long regarded his woodland as little better than waste land on the farm, and has not treated it as growing a crop. With the possibility of utilizing low grade material from his woodlands at a profit, the opportunity is presented of bringing about a changed attitude toward the possibilities of the forest. Indeed, the danger is that, because of the rapid increase in the stumpage prices of all classes of forest material, overcutting will result and we will have little left but fuel-wood sizes.

There are more than 6,500,000 farms of the United States upon nearly every one of which there is woodland. Most of the farm owners live on their farms and know what their lands will produce. True, they know less about their woodland than any other part of the farm, but there are always greater possibilities in dealing with a resident landowner than with a non-resident who does not depend upon his land for a living. Here, it seems to me, with the small woodland

owner, is our best chance to put silvicultural practices in motion in the shortest time, and in the most effective way. Much can be done through the County Agricultural Agent. The chief difficulty is to arouse him to the needs of timber growing on the farm. To this end, every County Agent should have, at least, a short course in farm forestry to qualify for his job.

We have been hopefully looking for the day when such forestry as we were able to practice would cease to deal chiefly with methods of exploitation, and would become in reality what it should be—the growing of timber as a crop. The practice of forestry could not succeed in advance of a substantial rise in local timber values. As long as there were large areas of virgin growth and it cost more to grow timber than it was worth, there was little room for the practice of forestry. With the virgin stands about gone in the East, and most of the States now importing lumber, we are rapidly approaching a timber growing status. The profitable growing of timber of mature size and good quality is only possible where thinnings and improvement cuttings can be made profitably, and this again hinges on utilizing much of this inferior material for fuel wood. A large and increasing use of fuel wood and profitable silviculture are, under present conditions, at least, inseparable.

RECENT OBSERVATIONS ON THE EFFECTS OF TURPENTINING ON THE STRUCTURE OF SECOND-GROWTH SLASH AND LONGLEAF PINES [1]

By Eloise Gerry

Microscopist, Forest Products Laboratory, U. S. Forest Service

Studies of the effects of turpentining on the structure of second-growth slash and longleaf pines have been conducted during the past year under the auspices of the Forest Products Laboratory of the U. S. Forest Service. Fortunately it was found possible in this work for the writer to cooperate with Dr. Austin Cary of the Branch of Forest Management. Dr. Cary has for a number of years been recording the yields of gum obtained in commercial turpentining on various test plots of second-growth slash pine (*Pinus caribaea*) and longleaf pine (*Pinus palustris*). There was consequently an opportunity to obtain material for microscopic study from stands which had been turpentined for some time. In some cases specimens were even obtained where the yielding characteristics of individual trees also were known.

The test plots are situated chiefly in the flatwoods country of the coastal plain area centering round the Okefinoke Swamp in southeastern Georgia. Of this region Dr. Cary has said, "No region in the world probably has greater natural facilities for producing timber values." The vigorous natural reproduction and rapid growth will be self-evident from the accompanying illustrations.

THE SIGNIFICANCE OF THE TRAUMATIC TISSUE IN RELATION TO YIELD

From previous work on virgin or mature longleaf pine it has been found that turpentining induces the formation of a large number of extra resin passages in the new wool formed above the wound or face. At the same time it tends to reduce the amount of wood (width of annual ring) and especially the amount and density of the thicker-walled summerwood in the growth rings produced near the wound.[2]

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[1] Presented at the Boston meeting of the Botanical Socety of America, December 29, 1922.

[2] United States Department of Agriculture Bulletin 1064, "Oleoresin Production."

One of the striking points noticeable at once in the second-growth timber is that fewer annual rings are cut with a streak of given width than in virgin timber. Consequently, the traumatic tissue plays a greater part in the production of the yield of gum, because after a few years' turpentining the greater part or even the entire exposed surface may be made up exclusively of traumatic tissue. If the tree is not too severely wounded, a highly specialized machinery for production is set up in this way. That the character of the first year's chipping in this timber is of the utmost importance in influencing the character of the tissue formed is therefore apparent, and is conspicuously shown in the illustrations. With conservative work a potential for continued high yields may be built up in the tree. With heavy, butchering work a fair yield may be obtained the first year, but the subsequent production is seriously curtailed and unknown wastes are incurred. It is obvious, for instance in Figures 2 and 4, that too much reduction in wood formation occurred the second year to recommend the methods used the first. Such methods as are shown in Figure 5 ruin the productive power of the timber and furthermore unnecessarily damage its later value for lumber.

If the first year's work is started late in the spring, the effect of the wound stimulus is not apparent in the formation of more than ordinarily abundant resin tissue early in the year, as is commonly the case when work begins in February or March. Figure 1 shows relatively few, late, resin passages as developed in some trees where chipping did not begin until April 29 (1922). This specimen was cut late in September (1922). This material and also the other sections shown were taken from directly over the face in the region most affected by the wounding.

The section shown in Figure 7 illustrates the responses of a slash pine tree which was being rather heavily turpentined for the third year. The specimen was cut May 26 (1922). Good wood formation occurred during turpentining. The illustration shows one-half inch of wood which exposes less than five growth rings, as compared with the ten to forty cut in a similar half-inch areas in mature timber.

TURPENTINING SMALL TREES

In second-growth timber, cupping small trees is far too common. The trees illustrated in Figures 2 and 3 were only 5.4 inches in diameter breast high when turpentining began. They are in an open stand and are very vigorous. These trees yielded, however, only about half as much as 8-inch trees. They showed varying ability to increase in

diameter and to heal in the two years during which they have been worked. It appears to be profitable to turpentine small trees for the purpose of thinning stands, but it is generally unwise to begin regular operations until trees are about 10 inches in diameter, breast high. Young trees 10 to 12 inches in diameter, however, produce excellent yields and stand turpentining very well.[3]

THE EFFECT TO TWO CUPS PER TREE AS COMPARED WITH ONE

Besides the turpentining of too small trees, one of the commonest errors is the practice, supposed to be profitable, of putting two faces in small trees. In a stand of hill slash pine turpentined for the past two years and shown in Figures 26 and 27 the two faces yielded in sample weighings something like 50 to 70 per cent more than one face the first year; but in the second year this yield fell to only 30 to 40 per cent more, and many trees with two cups showed visible injury or dry-facing. At the October (1922) weighing (end of the second year), the two-cup trees actually produced less gum than those with one cup. Sections from one and two cup trees are shown in Figures 28 to 30 and 23 to 25, respectively. It is obvious that the formation of wood and of resinferous tissue in the one-cup trees is superior to that in the two-cup trees.

In other cases of larger or more open-standing timber, especially in the case of longleaf pine, young trees will often sustain two faces, but the yield is not twice that of our face. (See Figures 8 to 12 and 13 to 16.) The market conditions and plans of the operator, whether he be a leaser or an owner, would dictate whether he should place one or two faces on the trees. The ability of the young tree to recover under turpentining is shown in Figures 10, 11, and 19, by the fact that during the third year's work (1922) the annual ring is wider than formed in 1921.

PRELIMINARY EXPERIMENTS AND MICROSCOPICAL EVIDENCE EMPHASIZE THE ADVANTAGES OF NARROW CHIPPING

The height of the chip as well as its depth is a matter of great importance. Figures 10, 11, 18, and 19 illustrate certain increases in wood formation in some of the trees under narrowed chipping. Relative increases in yield also accompanied this condition in several instances during the third year, at which time the chipper generally changes from the hack to the puller, or long-handled cutting tool. At this time

[3]Papers by A. Cary, Weekly Naval Stores Review, Savannah, Ga. 1922-1923.

the height of the chip, because of mechanical difficulties and the negro temperament, becomes reduced. Consequently, narrow chipping is practiced, not consciously because of its merits, but because it is too hard work to take off much wood with a puller. The face the third year is rarely as high as the face cut the first or second year. See, for instance, Figure 12 showing the height of the face at the end of the third year's work on longleaf pine.

Figure 22 shows a similar condition in slash pine. Here the two-cup trees had their faces located in the rich rolls of wound tissue next to an old face. This was very heavily worked, back-boxed timber. Most of the live bark between faces was removed, yet the trees showed a remarkable ability to adjust themselves and increase wood formation and relative yield, which was coincident with a reduction in the height of the chip removed each week. As the wood formation for 1922 in unturpentined trees was no better than that for 1921, the increased ring-width could not be accounted for in that way.

Another instance of the well-stocked tissue produced by relatively narrow chipping was found in some test timber at Hayner, Georgia. (See Figures 13 to 16.) One reason why narrow chipping produces sustained yields is especially apparent in Figures 14 and 15; it can be seen also in several other wood sections. (Cf. Figures 4, 8, 9 to 13, 18, and 19.) These trees (Figures 14 and 15) had been turpentined for two years. The sections shown are from chips cut at the height of the face at the end of the second year. It is noticeable that in the 1921 ring no resin passages are present in the early wood or springwood, whereas they are numerous in the springwood of the 1922 ring. These early ducts appear to be relatively short and are not usually found much more than one or two feet above the wound in the ring formed immediately following the wounding. Hence, the longer the chipping remains in this region the greater the returns that may be expected. The other resin passages formed later in the ring, however, not only are more abundant than usual, but also extend for a long distance, often 10 to 20 feet above the wound, and hence continually augment the flow of gum.

It is apparent that removing a thin chip keeps the turpentining in the region of most productive tissue. Also a thin chip is usually sufficient to start the gum running, and furthermore it lengthens the time that a face can be worked profitably before it gets out of reach.

Experience has shown the advantages of narrow chipping in a two-year preliminary test carried on in 1916-1917 at Columbia, Mississippi,

in which a chip less than one-half inch (only slightly more than one-fourth inch) in height was removed each week. Chipping which removes a scant half-inch weekly has been successfully practiced continously for eight years on the Florida National Forest. (See Figure 31.) Finally, in the case of several private workings this year, Dr. Cary has also found a relative increase in the production of the harder-worked trees where the height of the chip has been reduced as a result of pulling, as was previously pointed out in certain cases, in connection with the increased tissue formation of these trees. (See Figures 10, 11, and 18.) All the evidence so far collected indicates the probability of a gain in the vitality and producing power of the trees, if narrow chipping could be commenced the first year of the operation instead of the third or fourth. One or more tests on this point will be carried on in 1923.

PLATE I.

(FIGURES 1-16.)

Each photomicrograph shows a cross-section from a chip cut just above the face of a turpentined pine. Chips are mostly from midway between the "corner" and the "peak." The cracks in the sections are due to the shattering effects of the hack.

The *bark* is shown at the top of each picture.

The *1922 ring* of wood is shown next the bark.

The *summerwood* is the darker part of the tissue.

The *springwood* is the lighter-colored portion with the larger thin-walled cells. The *resin passages* from which the gum exudes are the scattered roundish openings. Their number and size indicate the character of the yield to be expected.

Fig. 1. Slash pine, turpentined for one year. Late beginning of work (April 29) caused lack of formation of early resin passages. Chip cut September, 1922.

Fig. 2. Tree from stand in Figure 3. Tissue formation seriously checked by two years' turpentining. A year's growth before turpentining shown by 1920 ring.

Fig. 3. Young slash pine 5.4 inches d.b.h. turpentined for two years. Growth seriously checked, yields often about half those of a tree 10 inches d.b.h. It is advisable to turpentine timber of this size only for the purpose of thinning stands.

Fig. 4. Vigorous old-field slash pine about 8 inches d.b.h. Heavily turpentined for two years with two faces per tree. Chip cut October, 1922.

Fig. 5. Ruinous methods of turpentining. Insufficient bark is left between faces and in one year more than 31 inches of face were used up in cutting 30 streaks. Compare height of year's work, Figure 6.

Fig. 6. Careful work; moderate depth and height of chipping and good bark bars.

Fig. 7. One-half inch of wood, or the surface width of the streak. Contains about 5 annual rings. This slash pine has been turpentined three years. Note fair tissue formation. Chip cut May 26, 1922; 1922 ring only partly formed.

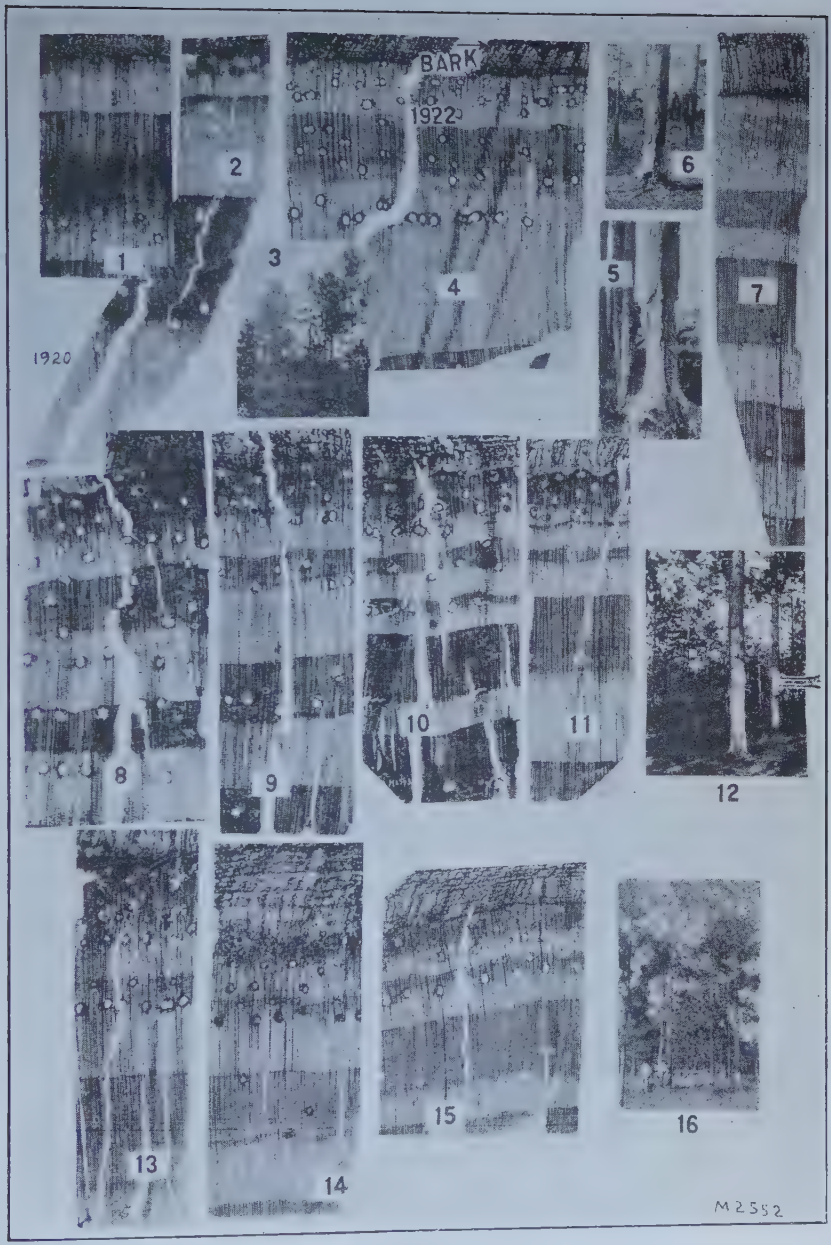

PLATE 1

PLATE II

Figs. 8-11. Longleaf pine sections cut November, 1922, from trees in stand illustrated in Figure 12. Wood shows the effect of three years' turpentining by abundance of resiniferous tissue. In Figures 10 and 11 note increase in growth in 1922 as compared with 1921. This is coincident with the removal of less wood in chipping.

Fig. 12. Young longleaf pine stand turpentined for three years. Narrowed chipping the third year removed less wood (less than 12 inches) than was cut in either the first or second year. This was coincident with improved tissue formation and increased relative yields. (Cf. Figs. 8-11.)

Figs. 13-15. Longleaf pine sections cut November, 1922, from the stand illustrated in Figure 16. Note rich resiniferous tissue produced during two years of rather conservative chipping. Note lack of resin passages in the springwood of the 1921 ring.

Fig. 16. Stand of vigorous young longleaf pine operated as an experiment by the owner.

PLATE II.

(Figures 17-31.)

Each photomicrograph shows a cross-section from a chip of wood taken just above the face on a turpentined tree.

The *bark* is shown at the top of each picture.

The *1922 ring of wood* is shown next the bark.

The specimens were all cut in November, 1922.

Figs. 17-19. Wood from trees in stand illustrated by Figures 20-22. A surprising vitality was shown by these hard-worked trees. Note particularly in Figures 18 and 19 that in 1922 the tissue formation exceeded that in 1921. This was coincident with narrowed chipping. (Cf. Fig. 22.)

Figs. 20-22. Slash pines growing in a "bay" with abundant moisture. These trees had been boxed and then recently turpentined again (back-cupped) and worked for three years. Although so hard-worked, they produced a good yield. (Cf. Figs. 17-19.)

Figs. 23-30. Old field slash pine growing on a slope.

Figs. 26-27. External appearance of stand; trees 15 to 20 years old.

Figs. 23-25. Sections from trees 10 inches d.b.h. which had been turpentined rather heavily for two years with *two faces per tree.* (Cf. Figs. 28-30.)

Figs. 28-30. Sections from trees matched with those shown in Figures 23-25 but having only *one face per tree.* Note better development of wood and resiniferous tissue in the one-face trees.

Fig. 31. An old tree turpentined conservatively, with one face for eight years. Note healing tissue forming near base. Trees in stand healthy and being back-cupped.

FOREST FIRE EDUCATION AND PUBLICITY METHODS[1]

By Chas. R. Meek

It is my aim to mention the various forms of publicity. I do not believe that any one kind is "best," due to what we call in Pennsylvania "local conditions." To illustrate my point, I do not believe a pamphlet reaches the man who does not read well, nor are newspaper articles as effective in the back woods as personal talks.

For convenience I am listing the main forms that publicity may take, but the order of importance is open for discussion. I have at the office a lot of posters that we use, some suitable only for State owned land, others for private land. There are, also, some bulletins and circulars which you no doubt have already seen. As we deem protection from fire the most important forest activity at present, I have in mind only publicity about forest fires, the object being, of course, to lessen the number of fires as a result of carefulness and to decrease the area by greater concern being given to prompt reporting and attacking of fires that do start. My list of methods of spreading propaganda is as follows: (1) Posters, (2) signs, (3) personal interviews, (4) speeches, (5) newspaper articles, (6) radio broadcasting, (7) motion pictures, (8) bulletins, (9) circulars, cards, stickers, etc., (10) paid newspaper advertising, (11) circular letters, (12) exhibits, (13) public camp grounds, camp sites, (14) boy scouts, (15) planting, (16) good hunting and fishing grounds, (17) proclamations, (18) prosecutions.

Some of these divisions might have been combined with others, and some of you may not agree are forms of publicity.

1. *Posters.*—They are of two kinds: (*a*) The pasteboard poster, tacked on boards or trees, that last about a year. The fact that they must be renewed makes possible a change in the wording which attracts attention. Care should be used in the selection of a durable cardboard and ink that does not fade. (*b*) The cloth poster, which is more durable if made of good quality of cloth, if good ink is used, and are carefully put up. In some sections rodents and bears are likely to eat or destroy pasteboard and cloth posters. We have had complaints

[1] Read before the Pennsylvania Section of the Society of American Foresters, February 23, 1923.

too of destrucion by boys and men. These cloth or pasteboard posters *must* be of several styles. I say must for we reach different people and the same people in different moods. I might mention color schemes too, but I believe the ordinary cloth or pasteboard poster is effective in black and white or black and manila. I have no costs on posters as we have them printed by the State Printer.

First, we must have the picture poster to appeal to the man that cannot or will not read. It's hard to get such people to consider posters and it's difficult to get the idea across.

Second, there must be the poster in large type that one can read at a glance without effort while walking or riding along.

Third, there is the poster with some reading of interest for the person who must spend some time in one place, as in a railroad station or street car, and whose roving eye is constantly in search of something readable and interesting.

These are the most important styles. We have put a copy of a proclamation signed by the Governor in every station and post office and a card "Save the forest—do not throw lighted matches and tobacco from the cars," in every smoking car.

2. *Signs.*—By signs I mean something larger and more durable than a poster. Usually a metal sign painted in attractive colors or enameled. The color scheme in these is of great importance. Some recommend the adoption of a certain combination of colors and then whenever that combination is seen it will stand for forest fire prevention—somewhat following the "Dodge Motor Car" advertisements. I believe if the sign is attractive enough—and the idea put over in a few words—it will be seen and read.

First, we erected in Pennsylvania green and white signs with various inscriptions. They were placed along railroads and highways and the letters were large enough to be seen from passing cars. Costs were as follows: 8 by 10 feet, $29; 5 by 8 feet, $19.75; 2½ by 6 feet, $10 to $13.75. Prices varied according to the amount of lettering and number purchased. These prices were f.o.b. factory. The signs were on galvanized steel on wooden frames. The slogan signs were 5 by 10 feet and cost $28.

Something should be said here about putting signs on poles. Some telephone companies will not allow this and when it is done only the pasteboard posters should be put on. Steel and flange signs may result in injury to the lineman.

The place and method of erecting signs and posters will greatly affect the ease with which they are seen and read. The wording of signs should be considered carefully. Some signs are necessarily "must not" signs, others "don't" signs, and others can be a mere statement of fact.

Painting signs on rocks along the roadside, as well as putting up too many roadside signs, may raise protests from associations and individuals interested in maintaining the natural scenery.

3. *Personal interviews.*—These are too expensive when men are especially detailed for the purpose, but they are productive of good results. They reach the man who does not read. All employees, especially towermen, should be impressed with the idea of convincing all visitors with the necessity of care with fire.

4. *Speeches.*—Speeches and talks will reach a large number of people and a convincing speaker can make a lasting impression. This form of propaganda can be carried on in public schools and before various clubs and associations whenever the opportunity can be secured. Colored slides illustrating forest conditions can be used to advantage.

5. *Newspaper articles.*—I am not a newspaper man, but from what I am able to gather from those that know, there are two kinds of newspaper stories: the story of general interest that can be sent broadcast and the story of local interest. Articles for general reading should be prepared by a specialist, but I believe anyone can write a local story that will take, if he sticks to the truth and gives names of locally known people and places. Articles of common interest can be made to carry forest fire propaganda. For instance a story of a local man killing a bear on a certain mountain can be woven in with his having killed the bear on a trail and then tell what a trail is—who built it and what it is used for, and bring in the fact that fires destroy forests and with no forests there will be no hunting.

6. *Radio broadcasting.*—This is a new stunt, and what the future will develop no one knows. It is a fact that there are eager listeners and short interesting talks will reach many people.

7. *Motion pictures.*—I need only mention motion pictures as a means of carrying our messages on protection. The thing that ought to be discussed is what type of picture is best and how can we reach all the people. We all believe the city man should have his share of protection education, but in the cities we can only show a short reel at long intervals unless our pictures are unusually good, for (1) people

pay admission to see the pictures, and (2) the houses believe the advertising worth something. In the smaller towns and cities no difficulty has been met along this line. Pictures can be shown to advantage by speakers at meetings and conventions.

In order to reach the rural population we have sent out a Reo Speed wagon with a generator and other necessary equipment to go to the county school houses and show the pictures to people who are glad to come and who do not often have an opportunity to see pictures. Of course, the date of the showing is well advertised.

8 and 9. *Bulletins and circulars.*—These are means of reaching people and carrying to them the thought of forest protection. I believe bulletins and circulars addressed to certain organizations or trades are more effective than general literature. For instance a bulletin on protection for Boy Scouts, another for farm woodlot owners, and one for lumber and wood users. They can be made in a way more direct than a general statement of fact—lumber users must be hit between the eyes with the fact that fires make costs higher—sportsmen must understand that fires destroy game—campers must be made to understand that fires destroy the forest beauty. It seems to me to make one bulletin appeal to all takes an unusual writer, an omnivorous reader, and takes too many pages. The more illustrations the better.

10. *Paid newspaper advertising.*—Unless quite an extraordinary message is printed at a psychological moment it appears to me to be a waste of money.

11. *Circular letters.*—They are very effective and costly, but I believe worth the money. The only circular letter that pays, it seems to me, is the one put up in good multigraph form, with the name and address filled in, the message a direct appeal, and signed in ink. The letter should make the recipient feel that an answer is necessary and that action is required. Think how many circular letters you get and how many you read?

12. *Exhibits.*—These are of value at county fairs and other places where people gather. I will include, also, the decoration of store windows. Exhibits in order to fascinate and hold the attention until the message is absorbed should contain some moving mechanical device that people will stop to watch and consider. Some living thing in an exhibit attracts. One time I saw in a store window a bee hive with the bees flying around and the crowd watching nearly blocked the sidewalk. I still remember the bees and also the thing advertised. A bulletin

machine in a window or with an exhibit is very effective. Models also attract, such as a model of a sawmill, farm woodlot, etc.

13. *Camp grounds.*—Perhaps you would not put public camp grounds in this classification of methods of propaganda, but I want to mention it. If the camp grounds are made attractive people will wonder who owns the land, who provided the equipment, what it is for, and being in a receptive state of mind they will read and remember signs posted nearby.

14. *Boy Scouts.*—In Pennsylvania in order to stir up interest and secure the cooperation of a powerful organization, the Commissioner offers each year 100 gold medals to Boy Scouts for meritorious service in forest protection. A book has been written for Scouts by J. S. Illick, called "Guide to Forestry."

Every Boy Scout who will sign a pledge to protect the forests is given a button and called a "forest guide." Every year that he does some worthy act he is given a bar with the year indicated upon it. The district forester distributes the bars.

15. *Plantations.*—A very effective form of propaganda is the plantation. It is remarkable how much interest a person or a community will take in protection after they have a personal interest in the forest. I know of one place where it was difficult to get local interest in protection, but after men were employed to plant about 100 acres all are interested in keeping the fire out for they all say, "I helped plant them" and "since we planted those trees there are more deer," etc. The establishment of municipal forests should be effective too.

16. *Hunting and fishing grounds.*—Good hunting and fishing grounds are more of an effect than a cause. That is, care with fire and the keeping out of fires makes good hunting. But good hunting grounds in one section can be used as an argument in another section, and hunters telling of their camp will spread the thought that absence of fires makes the hunting good and a bad fire would destroy what cover is there.

17. *Proclamations.*—Proclamations by the President and by the Governor have been tried, but to me they seem too long and too involved. I believe a proclamation in plain language in a few words saying "Forest fires are destroying our woods and timber supply, I want everyone to be careful with fire and to help extinguish fires," would be much more effective. I read the forest fire proclamations because I am particularly interested, but I do not remember of ever having read a sheriff's proclamation or proclamations on other subjects.

18. *Prosecutions.*—I have saved for last what you may not call propaganda, but it is certainly most effective in making some people realize what you are trying to teach. What I have in mind is prosecution of violators of the forest fire laws. A few successful prosecutions, the accounts of which are broadcasted in a county, certainly have a widespread and beneficial effect.

All educational propaganda can be summed up as follows, where a certain fixed sum is available for protection: First, we must determine the amount that should be allotted for the purpose and then spend that amount in the manner that will produce the greatest results for the money expended. That manner must be suited to the people that you are trying to reach, keeping in mind that propaganda to reduce fires from brush burning may not impress the transient, and that literature will not directly reach the man who does not read.

SERIOUS GROUND FIRES IN SOUTHWESTERN PENNSYLVANIA[1]

By Walter D. Ludwig

District Forester, Pennsylvania Department of Forestry

The purpose of presenting this paper before the Society is to set forth actual conditions with respect to unusual and serious ground fires which occurred during the past fall in western Pennsylvania and particularly in the southwestern part of the State.

The unusual conditions which were primarily responsible for these fires, as well as the abnormal meteorological conditions at the time were, so far as records are available, unprecedented in this section and these factors are such as to make the matter worthy of professional and technical record.

I fully realize that ground fires are of common occurrence in certain sections of the country but they are rare in Pennsylvania as a rule and under the circumstances excite more interest and comment than usual. For all these reasons I believe that the facts presented in this paper should be compiled and placed on record as a matter of professional interest.

METEOROLOGICAL CONDITIONS

During the past summer and fall southwestern Pennsylvania experienced the longest and most severe drought of which there is any authentic record. In fact the lack of rainfall and dry conditions prevailed generally over the State but the hard-coal region in the northeast and the soft-coal region in the southwest were more seriously affected than other sections. Furthermore, it is a fact that certain portions of these areas were more intensely affected and this is particularly true of a narrow belt stretching from Altoona westward to Indiana and southward to the Mason-Dixon line and this paper deals primarily with conditions in this portion, which comprises practically all of that area in Pennsylvania known as the Gallitzin forest district.

In this connection it might be well to remember that the forests in

[1] Presented at the annual meeting of the Society at Boston, Dec. 29, 1922.

the coal regions have been practically devastated to supply the mines and industries with timber and timber products, much more so than other sections of the State. The development of the coal industry has been very rapid and intensive so that the forests were called upon to supply an unusual demand for forest products. Whether this destruction of the forests was responsible for the severe drought is impossible to determine at this time, but it might be of professional interest to know that the Department of Forestry is collecting data now on this phase of the matter.

According to the reports of the United States Weather Bureau there were 1.6 inches of rainfall on June 8. Practically no rain fell in this territory after that until September 11, when a violent storm of short duration caused a precipitation of about 1.5 inches. Another rain of about the same amount occurred on October 7 and this has been followed by light rains at irregular periods. The Weather Bureau records show further that the driest period experienced was in 1908, when slightly less than fifteen inches of rain fell during June, July and August. For the same period this year these records show a rainfall of slightly more than nine inches, which is a little more than one-half the precipitation during the driest period of record.

Atmospheric conditions generally were greatly affected by this lack of precipitation. Temperature records kept by the Weather Bureau were broken on several days in August as well as the first few days of September. For three days in succession during the first week in September the maximum temperature went something over 92 degrees, the highest mark recorded being 97 degrees. This record-breaking heat was followed on September 11 by the violent storm which I have already noted.

The extreme drought also caused severe disturbances in the air so that there was considerable haze which obscured the view in all directions. This was especially noticeable during October and was so serious that it interfered greatly with the operation of the fire towers. The towermen reported generally that they were unable to see more than a mile or two from the towers at best, so that the detection system for a time was about paralyzed. At the same time the winds were so variable that one could not be sure of their direction from one hour of the day to the next. Over the forested areas there was no wind until about 10 o'clock in the morning when a slight breeze would arise. An hour later in many cases this wind would shift in

exactly the opposite direction, so that it was impossible to count upon favorable wind conditions in the matter of controlling or extinguishing the existing forest fires. I realize in this connection that these atmospheric factors are characteristic of an intensive dry period and I make mention of it here merely that these facts will not be overlooked.

It will be interesting to note further that an old "Goose-bone" weather prophet living in northern Cambria county set forth his views of the weather conditions to be expected during the fall season and I remember distinctly of reading his prophecies in the newspapers. I recall vividly that he said September and October would be extremely dry with periods of intense heat and followed by serious forest fires. This prophecy was made for this section and while I personally and professionally cannot believe in the predictions of these so-called weather prophets, yet I had so many occasions during the season to recall his prognostications that the matter left a distinct impression upon my mind.

Due to the lack of precipitation naturally the streams were seriously affected, so much so that many of the small cities and towns were without water for domestic purposes even as early as the latter part of September, something unheard of before. Small streams and springs never known to fail before within memory dried up completely, so that the people were compelled to haul water. Even at this time there has been little or no improvement in the situation so far as the water supply in reservoirs is concerned. The Quemahoning Dam, the largest industrial dam in Pennsylvania with a normal capacity of over eleven billion gallons, is now filled to only twenty per cent of its capacity and there is a steady decrease noted each day. This condition prevails generally throughout the district at this time and it is a matter of great and serious concern as to whether the water supply will last until the spring rains of 1923.

CHARACTER OF FIRES

The forest fires which occurred during the height of the drought period were a combination of crown, surface and underground fires. The majority of these fires were on the top and western slopes of the Allegheny Mountains. The largest fires were 1,500, 1,200, and 900 acres respectively and occurred from September 25 to October 7. The growth on the areas burned generally was less than 25 years of age and

was of the typical Appalachian second-growth hardwood type, consisting of mixed oaks, chestnut, maple, some little beech and birch with a scattering of hemlock. There was little or no slash or debris on the ground except the ordinary accumulation of humus which might be expected on such areas where forest fires have not burned for a period of ten or more years. The general elevations above sea-level average around 2,000 feet, with a maximum on the high plateau sections of slightly over 2,800 feet.

The largest fire during this period was of 1,500 acres on the western slope of the Allegheny Mountains in the vicinity of Beaverdale, Cambria County. This fire covered the watershed of the South Fork branch of the Conemaugh River, which will be remembered as the stream primarily responsible for the historical Johnstown Flood of 1889. Certain portions of this watershed were practical swamp with extensive areas of sphagnum moss. Naturally these boggy areas were thoroughly dried out by the drought and made a fire which was impossible to control or extinguish. At the same time, when the wind would rise during the morning the flames would be fanned so that they came to the surface and produced surface and crown fires. Towards evening when the wind would fall the fires would die down correspondingly and start to eat underground, so that it is proper to say that during the day there were surface and crown fires to combat, while during the night they became ground fires.

The next largest fire during that period was of 1,200 acres on the western slope of the Allegheny Mountains just a few miles north of Gallitzin, Cambria County, which is the highest point on the lines of the Pennsylvania Railroad system. The third largest fire was of 900 acres on the same slope of these mountains just south of the Beaverdale section.

In addition to these fires there were reported at least 80 other fires ranging from 300 acres in extent to less than one acre. The majority of these fires were of the same character as the larger fires noted in detail. From July 1 to date there were reported a total of 257 fires which averaged about 32 acres for each fire.

CONTROL METHODS

With the serious fires ordinary methods of control were not successful, largely because of the rapidly changing character of the fires themselves and the variable winds. In one instance a five foot ditch

was opened with dynamite to stop the ground fire; hardly was this completed until the wind caused a rapid running surface and crown fire which crossed the ditch.

Water helped the situation where it could be obtained but the springs were dry and the large streams so low that an ordinary bucket could be filled only by scooping out a pocket in the stream bed. One laborer carried 57 buckets of water on a large stump and still could not extinguish it. Under such circumstances the only hope was another Biblical Deluge and Flood.

The underground fires would eat their way down among the roots and stones, to break out in flame 50 to 75 feet distant from the fire lines and in a dozen places. It was impossible to have sufficient men on the lines to handle the situation and the only thing to be done was to fall back and start the work over again. This occurred each day until October 7 when rain fell which enabled the fire crews to control the fires.

DESTRUCTIVE EFFECTS

With the combination of surface, crown and underground fires it is to be expected that the damage would be serious. On these areas every living thing was destroyed, including fish and game which could not escape. From one small stream dead trout were carried out in buckets and those still living were removed to lower sections of the stream in an effort to save them. Due to absence of rain with no washing of material into the streams for food, the fish were ravenously hungry and in places could be seen jumping for the particles of ash, burned leaves and debris carried over by the winds to the streams. Some of the dead fish were examined carefully at the time and the flesh found of a distinct yellow color. This was undoubtedly due to the formation of an alkali in the body of the fish similar to the ordinary process of making lye from wood ashes and likely this was the immediate cause of their death in such large numbers.

Upon discussing this phase of the matter with old local fishermen I was told that this very thing was noted some fifteen years ago close to that section when a serious fire followed the lumbering of the virgin timber. Apparently the food value of the dead and dying fish was not impaired because the workers were so hungry that they broiled and ate them without seasoning of any kind and without any bad after-effects.

Small game and animals were also destroyed in large numbers. I recalled that four dead rabbits were discovered in an old log and others were found here and there in secluded spots where they had taken refuge. The birds and larger animals were able to take care of themselves.

The smoke and odor from the burning swampy areas was so pungent and noxious that it caused nausea and vomiting among some of the men so that they had to be removed from the lines. These effects, while not so noticeable on all the men, seriously interfered with the extinction work.

I need not mention in conclusion in this paper, which must necessarily be limited, just how serious the damage was to the growing timber and to the forest area itself. It is sufficient to note that the underground fires burned off the roots completely so that it is now possible to pull out the trees, roots and all without any effort. Where this did not occur the crown and surface fires killed the portion above the ground. It is not difficult to imagine what a serious hazard such areas will make in the future management of the woodlands.

Considering all factors I must admit that it was the most serious situation I have ever been called to control since my service with the Department of Forestry starting in 1910, and I earnestly hope that history will not be generous enough to repeat itself soon again.

EXTENSION WORK IN FARM FORESTRY IN NEW YORK STATE[1]

By G. H. Collingwood

Assistant Professor of Forestry Extension,
New York College of Agriculture

A large proportion of the nearly 200,000 farms in New York State have a woodlot, or, at least, they include some waste land which would be more profitably occupied in the production of timber. Every year a variety of economic and social conditions are bringing the problems in relation to these lands more forcibly to the attention of the general public.

Those who have taken the trouble to study the statistics as shown in the Federal census have observed that woodland and forest areas in farm ownership are getting smaller and smaller, while the area in waste land is increasing. At the same time many industries depending upon the neighboring forest have been forced to suspend operations or move to locations closer to the source of supply. During the past decade the annual lumber cut in New York State has very materially decreased. As a direct complement to the decrease in local supplies there has been a steady mounting of the prices of all woodland products, including the price of lumber. Needless to say, this has worked to the benefit of those farmers who have retained a large enough woodlot to have timber for sale, but distinctly to the disadvantage of those farmers who have found themselves in the market as buyers of lumber. As this has developed every farmer has become aroused to the importance of forest products in relation to his welfare.

Extension work in farm forestry aims to solve this situation by developing a program to have every farm woodlot so managed that it will be a profitable portion of the farm operation, and to extend the total forest area by the reforestation of all suitable non-agricultural lands. Such a program, if carried to completion, will benefit the farm owners and the community at large. It will result in the more complete and economical use of the land, and maintain forest production

[1] Read before the New England Section, Society of American Foresters, New Haven, Conn., February 23, 1923.

close to the large consuming centers. Ultimately it should achieve the ideal of a group of farm woodlots so managed that they will furnish raw material for the support of permanent local wood-using industries. To this end several forestry projects have been developed. As progress is made other projects will be added. At present we are dealing with the reforestation of open lands of non-agricultural value, and with the improvement of existing wooded areas, to the end that they may be placed upon a sustained yield basis. The matter of fire protection is so well taken care of by the Conservation Commission that it is given scant attention as an extension project.

The office of the extension specialist is very much of an information bureau. Letters asking all manner of questions find their way to his desk. At first I tried to give personal service on every problem from estimating a timber lot to prescribing a remedy for a sick shade tree. Very soon it became necessary to limit special trips to those cases which would tend to build up the program as stated. We make it a point to answer all letters or refer them to another department which may be in a better position to take care of them. To supplement the information which may be included in a letter we may send a bulletin or perhaps a mimeographed statement. I have found certain of the farmers' bulletins of the Department of Agriculture at Washington especially desirable.

All trips must be as a result of personal requests for the purpose of advising on forest problems are paid by the applicant on the basis of cost of travel and subsistence. No charge is made for time spent in the office preparing reports nor for the stenographer's services. The expenses for trips made in co-operation with the Farm Bureau or other recognized public organizations are shared with the State upon the basis of a sliding scale depending upon the distance from Ithaca. This tends to encourage the project method as operated through the County Agricultural Agent. The only exception to this policy is in the case of inspections or conferences preliminary to establishing a project, or in order to gain data which will be of value to the promotion of farm forestry in the entire State. Such trips are financed from a small administrative fund.

Various methods are resorted to in order to develop a favorable sentiment toward forestry. These include lectures, conferences, and to a limited extent personal visits—also bulletins, timely press articles, and exhibits. The personal visit is expensive, and unless it is tied up with

the establishment of a permanent demonstration, or with instructions to the County Agent or some local leader, it is doubtful whether it is worth while as an aid toward completing the forestry program. Lectures and exhibits, on the other hand, make contacts with a large number of people, but often are of doubtful value unless some follow-up plan can be inaugurated.

To encourage and aid in reforestation is the most spectacular, and in many ways the easiest to accomplish. It appeals to the imagination and to the altruistic instincts of a person. Definite instructions can be laid down as to how the planting should be done, and when the plantation is completed the planter can see that he has actually accomplished something. This work is done with the close co-operation of the Conservation Commission who furnish the trees at a nominal cost. This year they will have available for distribution 12,000,000 seedlings and transplants. Commissioner MacDonald hopes to increase the capacity of the State's nurseries to an annual production of 25,000,000 within a few years. With 4,000,000 acres to reforest even so large a program as this will take 160 years to accomplish. In the meantime, if protected from fire, large portions of the waste areas will have come in to a volunteer stand of tree species of indiscriminate values.

As a project reforestation takes on two phases—planting and growing. Aside from the mere telling or showing of how it is done, a demonstration in planting trees is largely a matter of establishing self-confidence on the part of the planter. It can also serve as a subject for various press articles. The plantation will become a valuable demonstration of the fact that trees grow, and that they have a distinct potential and in many cases a present value. Large signs, advantageously placed, telling the date of establishment, the kind of tree, the purpose, and perhaps the owner's name, are believed to be worth while and will be prepared for some of the more advantageously located plantations during the near future. Nothing is more productive of results than to have these growing trees brought forcibly to the attention of the prospective planter. Personally conducted summer field trips to such plantations are usually productive of results.

Demonstrations in the methods and results of cleanings, thinnings, and improvement cuttings have been started in a few instances. Unless they are a part of general woodlot management, it is rather difficult to command the same interest in them as in forest planting. The results are less apparent. This can be developed into a project which

will place the woodlot under a plan of management looking toward a sustained annual or periodic yield. We have a number of demonstration woodlots in the state, and the policy is to increase these as rapidly as possible.

No attempt has been made to give demonstrations in estimating the contents of farm woodlot. The great difficulty is to keep this from being entangled with purely commercial operations, where no forestry is contemplated, and which might better be taken care of by a professional timber cruiser or resident forester.

For three years we have been co-operating with the State Department of Agricultural Economics and Farm Management to secure costs of production of maple sirup and sugar. We also aided in the organization of a Maple Producers' Cooperative Marketing Association. The main purpose of this is to aid in making maple sugar a more attractive crop to the farmer. The departmental point of view is that maple sirup and sugar should be considered as a by-product in the production of lumber and wood products. Working on this basis, demonstrations in the silviculture and management of sugar maple groves will be inaugurated this spring. The work thus far accomplished has attracted a good deal of favorable attention among the farmers, but I feel we have scarcely scratched the surface.

It may be noticed that, except in the last case, all of the effort has been made toward aiding and giving instruction in the growing of trees, and nothing with regard to utilization or marketing. I realize the importance of extending similar aid in solving the marketing problems. This is too big a job to be accomplished with a staff of only one or two men; accordingly, no efforts beyond the giving of a few marketing principles have been attempted. I doubt if it is possible to give satisfactory service along this line unless one man devotes practically all of his time and thought to it.

A junior project for boys and girls clubs has been worked out, but for lack of available prize money, or other annual incentive, it has never gone beyond the paper stage.

During the past year the college entered into a cooperative agreement to lend its forces in assisting to control the white pine blister rust. This has been a remarkable case of the effective way in which an educational program can be carried on with the aid of the country agricultural agents. Most of the work has been done by the regularly appointed blister rust agents. Wherever they have worked in close cooperation with the county agents their work has been materially

accelerated. As extension specialist I have helped by giving lectures and preparing news material, but the real success of the effort has been due to the cooperation extended by the county agents. I believe this offers a striking example of the means by which the efforts of the extension specialist can be materially multiplied.

In spite of the fact that instruction in farm forestry in New York State has been going on for the past ten years, there is no reason to feel elated over the results. Only enough has been accomplished to keep from being discouraged, and to serve as a basis for more effective work in the future. It may be well, therefore, to briefly consider means by which forestry extension work can be improved.

In the first place, the extension specialist must devise means through which he can multiply his efforts, without materially increasing the cost of the work by increasing the staff. Personal service work on individual woodlots or plantations should be discouraged except where it actually prepares a demonstration. To be sure, a forestry demonstration may take years before it can demonstrate the point in mind, but as far as possible the preparation should be so arranged that other woodlot owners may be present to observe and ask questions. It would be worth while to follow it with an article describing what was done and the facts which are to be demonstrated. This can usually find ready distribution in the Farm Bureau News and in the local papers. Above all, the extension specialist must not forget that he is a teacher, and that his success is largely gauged by the number of people who hear and heed his message.

There should be an element of continuity in each project. The old "touch and go" methods of the lecture and the woodlot visit should be accompanied as far as possible by a follow-up plan. One may "sell the idea of forestry" to an individual or to a community, but if the work is to prove truly effective he will have to "deliver the goods." This is infinitely harder work and may curtail the apparent scope of his activities. Occasionally it can be accomplished by correspondence, but as a rule it will have to have repeated personal visits to an individual of leadership or to a committee. To carry this out naturally presupposes a well thought out plan as applied to the particular locality. To what extent local individuals untrained in forestry can be taught and inspired to carry the plan to completion, with occasional guidance from the extension specialist remains to be seen.

A corps of county or district foresters who will keep in close touch with all woodland owners, supervise forestry projects, and supplement

the work of the county agricultural agents, toward developing a well rounded forestry program would be very helpful, and is perhaps not too much to look forward to in the near future. There is a precedent for this in the existence of local fruit specialists in some of the important fruit counties.

The marketing problem represents the knottiest, although at present not the most important, of any problem confronting the farm forestry specialist. If the farm woodlot is to be the source of a profitable crop it scarcely needs to be added that the timber must be sold to advantage. Many farmers look to the extension specialist to help them find a satisfactory market for his timber, and several years ago I fear that we gave him reason to believe that he could expect such aid. Experience has shown that to be a marketing specialist in farm woodlot products is a man sized job. To be of real aid in solving this problem will take all his time and thought. Beyond teaching certain fundamental principles of marketing lumber, and occasionally passing on some worth while information as to timber prices and demands, I have not been able to be of any help. The problem is such a pressing one to many woodland owners that they will hustle around and solve it themselves, but unfortunately their efforts are often misdirected, with the result that the timber is sold to a disadvantage. A project of this kind needs to be carefully thought out in order that it may develop helpfully along educational lines, but at the same time avoiding any tendencies to be paternalistic.

In conclusion I think that every man who has attempted to encourage the practice of farm woodlot forestry will agree that we need the results of more research work as applied to the silviculture and management of these heterogeneous bits of timber.

NEW DEVICES FOR SOLVING SOME PROBLEMS IN TIMBER MENSURATIONS

By H. R. Wickenden

Chief Forester, Wayagamack Pulp and Paper Company, Three Rivers, Quebec

In an article in the October, 1921, Journal of Forestry on the use of the absolute form quotient method in timber estimating, I mentioned the getting up of time-saving devices, the construction of which could be simplified by the use of the form quotient method.

In forest mensuration we usually group trees according to diameter, taper, height, etc., in order to determine other quantities and variables which are required for forest operation and management.

The more we are able to visualize the groupings and variations of our records and observations, the more readily can the problems be solved. Graphic methods are therefore extensively used in this line of work.

The following is an explanation of a graphical chart system for analyzing and working up figures for taper, volume, log length and diameter, for determination of maximum or minimum trees satisfying any specification, and many other purposes.

We could properly call this graph a taper chart. It was invented a few years ago by a Swedish forester, Erik Ronge, and is extensively used at the present time in Sweden. I find it very useful in working up the results of timber estimates, because it provides an additional permanent record to which one will find many occasions of referring.

The taper chart is constructed as follows:

Having the d. b. h. as abscissa and the height as ordinate, mark the height location of the various diameters of any sized tree above its corresponding d. b. h. Join points, on different sized trees having the same diameter, by curves.

The taper chart thus consists of a system of curves having a somewhat parallel course, of which the topmost (the height curve) shows the location on the tree stems of the 0″ diameter and the other curves the location of the 1″ diameters, the 2″ diameters, the 3″ diameters, etc.

The construction and appearance of the curve is more readily understood when the trees are drawn in as on Figure 1. The actual appearance of the curve is seen in Figure 2.

FIG. 1.—This illustrates the method of construction and the purpose of a taper chart.

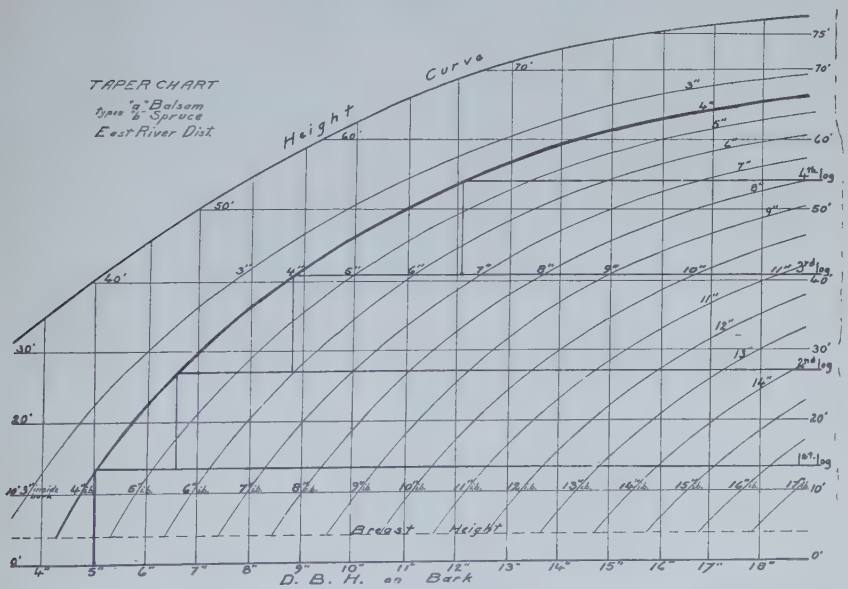

FIG. 2.—A complete taper chart. The portion at the stems taken by 13 foot 6 inch logs with a minimum four-foot top is also indicated.

It is to be observed that the d.b.h. scale is usually given for measurements on bark because these are the ones obtained in the field. The upper diameters which are used for log volumes and other determinations in which bark must be eliminated are better given inside bark. The necessary figures for bark thickness reductions are obtained anyway in most cruises where data for species in question is not already available.

The construction of the taper chart is very simple in cases where the height curve is already available. This is due to the fact that all other curves follow courses similar to the height curve. One only requires measurements for the taper series of relatively few trees. These are plotted out and the equal diameter curves are then arranged in consideration to the existing height curve.

If the absolute form quotient is already known for any group of trees whose taper chart is required the construction of the chart becomes quite simple. All of the diameters necessary for curve construction can be got out of the absolute form quotient taper tables. It is to be remarked that when absolute form quotient methods are used one only requires measurements of bark thickness at breast height. This is readily determined in the field.[1]

Some of the problems which can be solved by the use of these curves are:

Determination of the yield and sizes of saw logs and pulpwood when saw logs are taken to some minimum diameter (and probably a fixed length) and pulpwood is also taken to a fixed minimum diameter in the remainder of the tree.

Determination of log length or lengths for greatest wood economy.

Determination of the minimum allowable diameter of logs.

Graphical adjustment of stem analysis figures which are intended for volume tables or other uses. When the taper series of the different trees are taken independently of each other, there will be a certain unevenness of results unless the material used is very large. The erection of taper chart insures a harmonious progression of the taper series from one diameter class to another. The accuracy of the results for any one tree dimension is thus increased by the support of the observations made on all other dimensions.

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[1] If the form point method is used in determining form quotient. (See article in JOURNAL OF FORESTRY, Oct., 1921.) The only field work required for taper chart and local volume table will be a few sample trees on which observations are made for height and form point with an ordinary fractional hypsometer.

I have modified the original form of the taper chart to give a better representation of certain conditions. If the d.b.h. abscissa scale is made proportionate to the number of trees in each of the d.b.h. classes one gets a better idea of the amount of timber represented in the various portions of the chart. If for example it were a question of top waste in cutting logs of certain lengths and diameters one would get a better occular impression of conditions if the biggest portion of the chart was taken up by the tree dimensions which form the majority of the stand. (See fig. 3.)

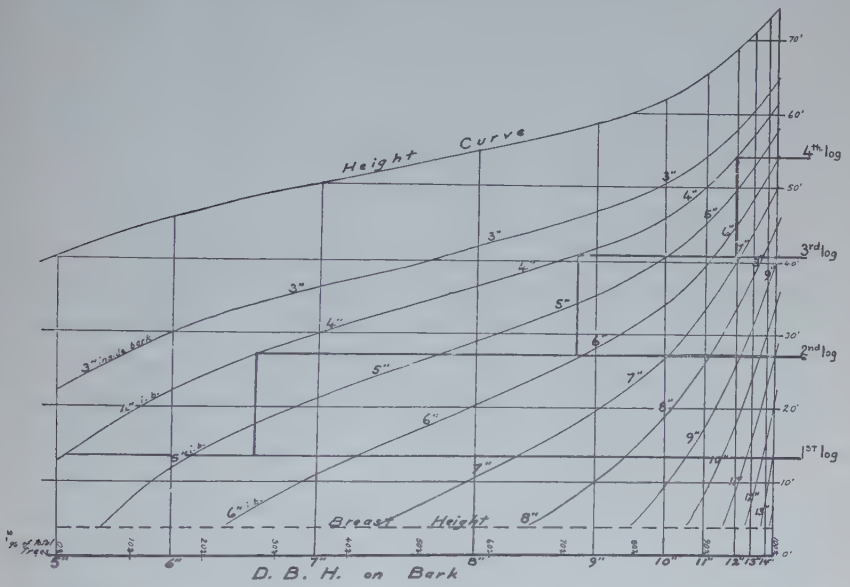

FIG. 3.—Taper chart on a percentual size distribution base. Note the graphic presentation of top waste in the different sizes.

A chart such as this can only apply to cases for which the average tree diameter is practically the same as that of the material from which the chart is constructed. However, since the chart is usually made for more or less fixed types and conditions, this limitation does not form a real handicap.

One can get satisfactory results similar to those obtained above but more analytically by simply superposing along the d.b.h. base a scale giving the relative number of trees in the various diameter classes. The scale would be in the form of a running total from the smallest to the largest diameter included in the tally. It can conveniently be expressed percentually.

Table 1 is of great assistance in determining the amount of wood which can be obtained in logging certain forest according to any log lengths and sizes.

TABLE 1.—*Percentual Portion of Total Stem Volume Obtained for Different Length of Stem Wood Taken in Making Logs.*

Form classes	Per cent of the stem above breast height (4.51 feet) taken in making logs							
	10	20	30	40	50	60	70	80
	Per cent of stem volume in the logs							
0.55	25	41	56	68	78	87	93	97
0.60	27	45	59	71	81	89	94	98
0.65	29	49	62	74	84	91	96	98
0.70	32	52	66	77	86	92	97	99
0.75	36	56	69	80	88	94	98	99

It may be helpful to anyone interested in this article to follow the solutions of certain problems involving the use of the above charts and tables. Assuming that the material consisted of the following tally, the diameter classes of which are denoted according to the lowest diameter in the class, also assuming that this material was similar to that represented by the chart, the following information might be required:

(1) Total wood volume.

(2) Actual volume taken for logs.

(3) Total number of logs, of say 13 feet, minimum 4 inches top, 6 inches extra being allowed on the length for driving loss.

(4) Average log in cubic feet.

(5) Average log in feet b.m. to any log rule (taking in this case the Quebec rule for 13-foot logs).

Prof. Tor Johnson gives among his tables one which shows the percentage of total wood volume taken when logs have a certain top diameter. When logs are taken to a fixed length as is usually the case the precaution must be taken in using this table that the actual average top diameter of the top log is used and *not the predetermined minimum diameter*. The top logs may be, on the average, one or two inches greater than the minimum diameter allowed because the full log length cannot always be taken in the tops.

D.b.h. (inches)	5	6	7	8	9	10	11	12	13	14	Total
(*a*) Number of trees	15	17	20	15	9	5	4	2	2	1	90
	Obtained from local table, or absolute form quotient table, using heights given in figure 2 and form class 0.65 (determined on chart or in the field.)										
(*b*) Wood volume, cubic feet	42	78	134	138	112	80	82	50	61	36	813
(*c*) Per cent of stem length above d.b.h. taken for logs	*Obtained from Taper Chart, figure 2.*										
	25	35	48	44	66	61	58	71	71	68	
(*d*) Per cent of stem volume taken for logs	*Obtainel in Table 1 for form class 0.65.*										
	55	66	82	78	94	91.5	89.6	96.2	96.2	95	
(*e*) Stem volume taken for logs, cubic feet	*Obtained from (b) and (d).*										
	23.1	51.5	110.0	108.1	105.2	73.2	73.1	48.0	58.6	34.2	685
(*f*) Logs per tree	*Obtained from the taper chart.*										
	1	1.3	2	2	3	3	3	3.6	4	4	
(*g*) Total logs	*Obtained from (a) and (f).*										
	15	22	40	30	27	15	12	7	8	8	184

The average log contains therefore 3.73 cubic feet. See (*e*) and (*g*).

The average diameter of a 13½-foot log containing 3.73 cubic feet is 7.1 inches (slide rule).

The top end of a log whose middle diameter is 7.1 inches will be about 6.2 inches (taper chart).

A 6.2-inch log 13 feet long contains 15 feet b.m. (Quebec rule).

The conversion factor for cubic to board feet will be $\frac{15}{3.73}$ feet b.m. = 4 feet b. m. per cubic foot. (This is a fairly constant figure for logs of this top diameter, length, and trees more or less of this size.)

The total production from the above trees is: 184 logs and 2,760 feet b.m.

A NEW CRUISER'S STICK AND UNIVERSAL VOLUME TABLE

By H. H. Chapman

E. A. Braniff was probably the originator of the idea of placing a tree volume table upon a Biltmore stick in order to enter the volumes of the trees directly on the tally sheet and save subsequent computations. In practice for cruising large areas in the West, this idea never worked out properly. But for smaller second growth hardwoods and conifers on the Northeast, and for the owners of small woodlots, it has a very practical application.

The Federal Land Bank of Springfield, Mass., through its executive assistant, Mr. E. D. Strait, has now put out a Biltmore stick giving the volumes of trees in board feet, for 16-foot log lengths. The International ¼-inch kerf log rule was selected as the basis of these tables, since it gives a conservative content yet consistent for logs of all sizes. It has the added advantage of being nearly as accurate for the tree when cut into logs of other lengths than 16 feet, since this log rule allows ½-inch taper for each 4-foot length. Five sets of values are given for conifers, namely, 2, 2½, 3, 4, and 5, log trees for 16-foot logs. The volumes are based on utilization to a 6-inch top and can be adapted to 4-inch tops by first estimating to 6 inches and then adding 5 board feet. In any case, the point of measurement must coincide with the rule, e. g., 6 inches. Trees cut to 8-inch tops are therefore estimated to 6 inches and 20 board feet deducted. This universal volume table for conifers is then corrected by indicated per cents when applied to species or ages which tests showed did not give the values indicated. For instance, hemlock is said to overrun from 10 to 15 per cent, red spruce 5 to 20 per cent, depending on diameter, while other conifers are said to correspond with the table.

On the reverse side of this stick is a table for the volumes of hardwood trees. Here the values are for utilization to a 6-inch top for trees up to 12 inches d.b.h. Above this, the top is to have one-half the diameter inside bark of d.b.h. of the tree. A 20-inch tree is thus scaled to 10-inch top inside bark. This is said to agree with the average practice in utilizing hardwoods. Values are given for 1½, 2, 2½, 3 and 4 logs trees, for 16-foot logs, and the same principle applies in that the total used length will give the volume regardless of the log lengths cut.

The author correctly states that where trees are utilized to smaller tops than the standard, the table will over-estimate the contents and vice versa.

All values in board feet are reduced to a decimal rule for convenience in utilizing space on the stick. Cordwood values are given in decimals of cords per tree, but only for one average height, for lack of space, but separately for conifers and hardwoods.

Since the ¼-inch kerf is the basis used for these volumes, the sawing of round-edge boards, or of dimension lumber will give an overrun as will also the sawing of boards less than 1 inch in thickness if measured by superficial feet.

Checks by the author show that the volume for conifers runs 15 to 20 per cent lower than by the Massachusetts volume table for round-edge boards. It was also found that some hardwoods, when scaled by separate logs overran by 10 per cent or more. Obviously, these variations depend first on form factor and second, on thickness of bark.

The stick has upon one edge a spacing for height measurements, on the principle of the Merritt hypsometer. It is graduated for 16.3-foot logs, to be read at a distance of 59 feet, which is the radius of a circle containg one-fourth acre. It may also be used as a pachmymeter, e. g., for measuring top diameters. In case of hardwoods, however, since the volumes are based on top diameter inside bark there would be a slight error in using the stick as a pachymeter. When the stick is held at 25 inches from the eye in the vertical position, the narrow edge intercepts a diameter of 8½ inches. The stick can also be used in another way for this purpose, namely, by cutting a notch exactly in the middle of the top. If the stick is then held vertically and at such distance from the eye that its width just covers the d.b.h., the point at which, when raised or lowered, the upper diameter is just covered by the one-half width noted, gives the diameter outside bark equal to one-half d.b.h. and the height to that point simultaneously.

With the book of directions and the per cents of correction indicated for different conditions of utilization and species, the average woodlot owner and farmer should have no difficulty in making use of the stick.

A second stick is put out containing the International ¼-inch kerf log rule, for values up to 35 inches and log lengths of 8, 10, 12, 14, and 16 feet.

The Federal Land Bank requires the mortgagee to apply for permission to cut any timber from woodlots connected with farms on which loans have been made, since the value of the woodlot is always considered in determining the security. Young growing stands of pine

not yet mature are considered the best security for federal loans. The bank improves the opportunity which this relation holds out, to issue short but pointed instructions intended to secure a better treatment of the woodlot, which they state is the most abused portion of the farm. These instructions aim at discriminating in cutting between cordwood and the more valuable products, using the cordwood demand to secure thinnings and the utilization of waste products. The farmer is warned against pasturing, is told to pull up all currant and gooseberry bushes to guard against blister rust, for young pine will have no value as security for loans unless so protected, and is told to protect his woodland from fire. We quote:

"Through our close co-operation with the States Colleges and Forestry Departments of the various States in the district we are prepared to give additional information. Furthermore, in cases where it is desired and considered advisable, arrangements can be made for a man to visit the farm and show by actual instruction and by demonstration the most satisfactory and approved methods of managing and developing a piece of timber land. The cost of this personal visit by the forester will be borne by the owner himself. It is small, however, involving only his expense of travel and subsistence, as the State pays his salary.

"We would again emphasize that we believe the wood and timber resources on the average farm are not fully realized and are in only a very few cases developed in a systematic way. Your mortgage to the Federal Land Bank is made for a long period of years. We believe that in many instances the growing wood and timber, if properly handled, will, over this period of years prove not only a great help in meeting the regular installments, but in time may so develop as to pay off your loan in full.

"We believe that every farmer should have a good working knowledge of the amount of wood and timber on his lanl, and to help in this direction we have designed and made up two measuring sticks: One of these is for use in estimating the volume in board feet and cords in standing trees; the other is for use in scaling logs. Both of these are well made, accurate and practical. These were made up primarily for use by our appraisers but knowing that many of our borrowers would want them we contracted for more than our needs (thus getting a very reasonable price per set) and are distributing the surplus at cost. The set of two will be sent postpaid upon receipt of $1."

GOVERNMENT RESPONSIBILITY IN FOREST REGULATION

By Howard B. Morse

The question of governmental action leading toward regulatory measures for our forest lands is one which has lately received considerable attention.

The Snell and Capper bills were cussed and discussed at the time they were presented. Proponents and opponents argued for and against. Some were for Federal, some for State, and others for individual control. Very little was arrived at and yet considerable was said of great interest.

Strange as it may seem the foresters could not agree on any such fundamental law, as each was looking at it from a different angle, either of public or private, personal or employed, or financial or aesthetic viewpoint.

Yet with it all we learned that a great many believed something should be done and except in a few cases, all tried to make it cost nothing.

Now we have the meat in the shell! Can it be done and cost nothing?? This question can be answered from two angles, namely—Cost nothing *now*. Cost nothing in the *end*.

Personally, I believe it can be done under good business management and cost little or nothing in the *end*—but that it cannot be done and cost nothing *now*.

Should this, however, be a deterrent? We have Colonel Greeley saying: "Such a program involves putting private lands in a class with public utilities. We must recognize a dominant public interest in the way in which this form of private property is used. It must, however, be recognized with equal force that timber cannot be grown unless the undertaking is a practical and reasonable one for the owner. Growing timber is an economic matter. Reasonable and equitable aid must be given the private owner in accomplishing the public benefit desired, and such conditions of security must be created as will make it economically feasible for him to comply with public requirements. Various State laws have already applied the principle of public control—Ore-

gon, Minnesota, New Hampshire, and Louisiana for example. But we are very far from a uniform or consistent application of this principle. To bring that about by one means or another must be one of the important features of Federal legislation."

Mr. Pinchot says: "It is a large statement, of course, to make, that the biggest economic question before a nation such as ours is this timber question, but I think the truth is absolutely clear and irrefutable." Again he says: "Our whole standard of living, our whole business and commercial organization, is based on the use of about 300 board feet per capita, where Europe uses only half as much."

Again: "You understand that half of all the wood used in the United States is used on the farms. It takes one-half of our total consumption of timber to grow our food. Then after that food has been grown, it has got to be shipped by rail. You cannot ship a pound of meat without the help of the forest. You cannot load a box-car, you cannot get a railroad tie, you cannot mine a ton of coal or a pound of iron without the forest. You cannot provide a suit of clothes without the forest or eat a meal without the forest. The whole thing is interwoven in our national life to a point that makes the use of wood in some sense the critical thing in establishing our cost of living and our commercial and individual welfare. It is the key to our individual safety and comfort and prosperity."

Again he says: "Another thing, it is the man in the city who is going to feel the pinch first. You grow crops on the farm, taking one-half the wood used in the United States, and when they are grown you have got to move them. You have got to transport them and you have got to pack them. It takes something like one-fifth of all the sawed lumber, according to a figure that has been given to me, used in the United States for packages alone, and the fact of the matter is, the people in the big centers of population and in the densely populated States that are mainly concerned in this thing, and whose interests have got to be considered. It is not going to be the foresters who will settle the question, and it is certainly not going to be the lumbermen. It is going to be the great mass of consumers among the people of the United States, and the sooner they can be made to understand how critical their situation is the better it is going to be for them, in my judgment."

Thus we have the opinion of only two of our well posted authorities, and there are many more voicing the same thoughts.

These remarks lead us, therefore, to the conclusion that something should be done, preferably under Federal control, thus equalizing conditions, and that whatever is done should not be confiscating in character and that certainly the people at large should be protected to the full extent of Federal power.

One can also justly point out that there are other things to consider besides the products of the forest in wood form, such as equalizing water flow both for the safety of investment in industries and protection of homes from floods, general health conditions, including pure water; recreation, including hunting, fishing, exercise and other aesthetic desires of the people.

With this as a prologue why cannot we set down and form some just legislation, remembering both the public and the owner? Some basis must be recognized as a starting point. Why not therefore start with a basis that our Federal Government is paternal and its first duty is toward its children. Therefore we must be led to the conclusion that for their benefit it is responsible that certain things are carried out, at a minimum expense with justice to property owners. This leads us to the statement that whatever is done shall be paid for and when the crop ripens the returns will either entirely or practically cover expenses.

We now come to the owner, whose money is invested in certain lands and industries. This industry usually is subject to control covering short periods, with very little opportunity to play a long time waiting game of putting money in a sack each year with hopes of returns 40 to 100 years hence. Is it his duty to anybody or anything to stand such a strain?

Also any regulatory measures put in force should apply equally to his competitors and be financed by the Federal Government until that time when the crop is harvested and returns are received.

Uniform regulations for regions would cover: Organization, taxation, insurance, protection, regulations, slash disposal, etc., and reforestation. Covering these matters the following suggestions are made:

(1) *Organization.*—All wild lands (no farmer's woodlots) separated from other lands and handled under the following methods by the Federal Government.

(2) *Taxation.*—Uniform yield tax collected directly by the Government, the State collecting taxes from the Government each year as heretofore.

(3) *Insurance.*—Federal Government to finance insurance department to insure all wild lands at a rate low enough to be attractive. Premiums compulsory to all owners.

(4) *Protection.*—Fire protection to be handled by Federal Government making forest land an insurable risk.

(5) *Regulations.*—Uniform cutting regulations to be formulated by regions to be carried out along same lines by competing industries.

(6) *Slash Disposal, Etc.*—Slash disposal and other regulatory operations to be formulated by regions with uniform rulings for competing industries.

(7) *Reforestation.*—When necessary, to be paid for by Federal Government. Planting stock to be supplied by Federal Government nurseries. Plantations to be non-insurable until Government investment has been liquidated by the land owner. If not liquidated the Government can sell at end of rotation at market price to owner (first) or others.

Then with these essentials embodied in the Regulations the Government would: Establish regional headquarters, provide for protection, receive yield tax, pay state taxes, finance insurance department, pay losses, finance reforestation, and inspect.

Each region would then have its corps of Government men to handle regional matters, in which each industry would have suitable regulations depending on its needs.

Still further we can see the Federal Government preventing exportation of timber if home needs are being overlooked.

SUMMARY

We have then a responsible Government regulating for the good of the majority and recognizing that by so doing it is playing its part and yet leaving the owner his property in an insurable, prosperous condition. At the same time not regulating an area over large for the country's futures needs, by recognizing only certain lands as "wild lands."

Government ownership should, therefore, not increase much more than at present.

Regional headquarters to handle all regional matters, thus insuring greater understanding of regional conditions and needs.

States will obtain taxes as usual and can count on a much more certain and brighter future from industries capable of continuous production.

Owners will still own property, which they can sell at any time if desired. Property insured at an attractive figure with Federal Government as security. Property properly managed for continuous production and taxed when products are marketed. Owners can reforest if they so desire, in which case the plantation can be insured for cost.

A METHOD OF DETERMINING THE TECHNICAL ROTATION FOR YELLOW PINE STANDS OF ARIZONA AND NEW MEXICO

By Hermann Krauch

Forest Examiner, U. S. Forest Service

The group formation is typical of western yellow pine stands in Arizona and New Mexico. The individuals comprising a group vary greatly in size, sometimes ranging from 7 to 24 inches in diameter among closely spaced trees. The amount of difference varies inversely with the degree of spacing; that is, where trees are closely spaced there is generally a greater range of diameters than where they stand well apart. Each group—and this is the essential point involved under the following discussion—is, however, practically *even* aged. The great range in diameters is chiefly due to differences in crown area of trees and their position with regard to exposure to light, although differences in root spread are also responsible. Root spread may, however, be considered as being proportional to crown areas and therefore really a *result* of light relationship. Those trees whose crowns stand above the others, or which have one side well exposed to light, will usually be found to be the largest in the group. Those whose crowns are shaded heavily will be relatively small. Classification is therefore made with reference to light and the trees designated as dominant, co-dominant, intermediate, and suppressed. The dominant trees are the tallest and their crowns reach out above the others. They are generally situated in the center of the group. The co-dominant trees are slightly shorter than the dominant, but often have a larger aggregate crown area, because they are situated on the outside of the group. Consequently, the co-dominant trees may be as large or even larger in diameter than the dominant trees in the same group. Intermediate trees are those which have been partially shaded by the dominant and co-dominant trees. Their crowns are therefore short and narrow, and diameter growth has been seriously checked as a result. Growth may, however, again become accelerated if the crowns have a chance to reach the light. Suppressed trees are those which have been heavily shaded from above as well as from the sides. These seldom or never get a chance to receive full sunlight. Consequently,

they grow very slowly from the start and generally perish as the group approaches maturity.

From this brief description of groups it will be seen why trees of the same age may vary greatly in size. A slight difference in the age of the individuals comprising a group may, however, be the chief factor determining their position with reference to light.[1] Those trees which attain the lead are most likely to keep it and to maintain a correspondingly superior growth. Knowing, however, that groups are practically even aged, it is possible to determine the average diameter or better, the average volume of trees having the same age. The practical value of such data is evident in that it enables us to determine the time required to grow timber of merchantable size and thus gauge the rotation accordingly.

Following is the procedure for gathering the field data:

1. Select tree groups of various ages for measurement. The relative differences in age can be roughly determined from the diameters and color of the bark. The nature of the tree groups is judged from a previous survey of forest conditions, and those selected for measurement should be apportioned accordingly. Thus, if the predominating groups are dense, one takes most of the measurements in such groups. If a large percentage of isolated trees are involved, a proportional number of these should also be measured. Before commencing this work, therefore, it is desirable to caliper up 160 acres or more in order to determine the exact conditions which obtain.

2. Determine the limits of each tree group to be measured. The trees belonging to a specific group can usually be accurately determined because there is considerable space between this and the next group. Frequently a veteran tree stands in the midst of a group of young blackjacks, but it is obvious, of course, that this tree does not belong in this age class.

Now measure and tally the diameter of all trees occurring in a single group and describe each tree with reference to crown classification and vigor. Indicate the confines of each group by placing parentheses around the trees involved. With an increment borer extract a core from one or more trees in each group, boring through to the pith at breast height. Count the number of annual rings in order to obtain the total age of the tree at breast height. The average of

[1] The difference in vigor of trees, however, also accounts for a difference in size, and a group of exactly even-aged trees may therefore also vary with reference to the rate of growth.

counts made will be the average age of all the other trees in the group.[2] Where the trees are large it is, of course, difficult to secure borings which reach to the pith. Generally, however, a tree of sufficiently small diameter will be in such a group and the age of the larger trees can thus be ascertained anyway.

3. Having measured and determined the age of sufficient groups and isolated trees, combine those having the same age. For all practical purposes ten-year age classes are close enough. Trees are thrown into the age class they most nearly approach; *e.g.,* 66 to 75 year old trees go into the 70-year class; 76 to 85 year old into the 80-year class, and so on. Now determine the diameter of the average tree for each age class. This is done by using a basal area table; the sum of the basal areas is divided by the number of trees involved, and the diameter corresponding to this figure will represent the diameter of the average tree. Since under forest management, suppressed and intermediate trees would probably be removed in thinnings, these should not be included in the calculations. If it is desired to know the average volume instead of the average diameter at a certain size this can be computed by recording the volume of each tree and dividing the sum by the total number.[3]

The following table is based on field data gathered on the Sitgreaves Forest in August, 1921, and compiled according to the method outlined.

TABLE 1.—*Average Diameter of Trees at Various Ages, Sitgreaves National Forest.*

Age	D.B.H. (outside bark)	Number of trees as basis
80	12.8	129
90	15.0	23
120	18.5	32
140	19.8	61
155	20.2	24
195	22.4	11
200	21.9	8

[2] Borings 10 inches long can be extracted so that the age of trees up to 20 inches in diameter can be determined. In the case of isolated trees it will be necessary to resort to stump counts for trees over 20 inches d.b.h., unless a longer increment borer is available. To the age obtained at breast height must of course be added the time required to grow to that point. This is previously ascertained from a study of seedling height growth.

[3] The average volume also has a greater practical value in that it more nearly indicates the best age to cut. To obtain the average volume is, of course, necessary to take height readings in addition to diameter measurements.

The table shows that between 140 and 155 years the average tree would be about 20 inches in diameter. Trees of this diameter are of good merchantable size, although larger diameters are more desirable. However, the time involved to produce larger trees is too great to warrant the difference in size to be obtained. This fact is revealed in the table which shows that at age 200 the average tree is only two inches larger than it is at age 140 to 155.

It should be borne in mind that the diameters given for various ages represent *averages*. Actually, there will be trees of many different diameters in the same age class, but the average will probably be as indicated in the table and this is the essential thing to know so far as the determination of a rotation is concerned. The reason that the values in the table show so little increase with increase in age is apparently due to the death of the fastest growing trees as the stand approaches maturity, thus tending to reduce the average diameter. If one were dealing with the individual tree, or with trees growing under similar conditions, a consistent relationship between age and size of trees would undoubtedly obtain. Attention is called to the fact that the figures cited in the table are the result of the first trial of this method. The trees selected for measurement were not chosen on the basis of a previous survey of actual conditions and are therefore only considered to be approximate. The results are based mostly on trees growing in groups. If more isolated trees had been included the average diameter at different ages would probably be considerably higher.

It may be asked, "How is it possible to determine the correct proportion of trees to select for measurement so as to represent truly the conditions which exist over large units?" As mentioned before, this can only be done by making a previous survey of a large unit. This involves the calipering of all trees and keeping a record by tree groups and by individual trees, depending upon how they occur. From such data the correct *proportion* of different groups and isolated trees selected for measurements, should be obtainable. This, of course, is simply a theory that has not been verified as yet, but it certainly appears to be correct. As an assurance that the measurements will be representative it would probably be best to actually determine the age of all groups and isolated trees within a solid unit, say of 160 acres. This would by no means entail an excessive amount of work since only one or two trees in each group need to be bored. Or better still, if it is possible to select areas which are to be logged one can

previously note the diameter and character of trees to be cut—placing a numbered tag at the base in order to identify these trees when one returns to make age counts of the stump. This will be especially useful in the case of large trees of which it is difficult to determine the age by means of the accretion borer.

The value of the method outlined is that the date can be gathered at a minimum cost, since the age of only one or two trees in each group need be determined. The ages of isolated trees must, of course, also be determined, but since these involve mostly the large diameters many of them will be cut at the time of logging and their age therefore readily obtained from stump counts. Such trees should, however, be measured previous to cutting in order to avoid the necessity of constructing a taper table for determining the breast-high diameter. Moreover, since most unhealthy and defective areas are removed in logging virgin stands, previous determination of these is necessary so that they can be excluded from the growth data.

The procedure is therefore briefly this: Select an area of virgin forest which is to be logged, and place a numbered tag on all trees to be cut. Measure these, but exclude such as are not considered to be representative of trees in a forest under management. Return after logging to obtain age counts from stumps. Determine the age of tree groups and isolated trees which will *not* be cut, by means of the accretion borer. This procedure thus combines the valuable features of each method—either of which alone is not satisfactory. Depending upon stump counts alone excludes the younger age classes, while the use of the accretion borer alone makes it difficult to determine the age of large and especially isolated trees.

In conclusion I wish to say that this paper has been presented with the view of suggesting a method rather than an attempt to qualify its value. It is also desired that criticisms be freely made so that the method may be modified or corrected accordingly.

SOME RECENT DEVELOPMENTS IN FORESTRY EDUCATION [1]

By J. A. Ferguson

In the early days of forestry in this country there arose an immediate need for trained foresters. The few foresters in the country at that time had received their training largely in foreign forest schools. This need became urgent with the transfer of the Forest Reserves from the Department of Interior to the Department of Agriculture. It would have been easy to have induced German, English, French, and Austrian foresters to practice their professions in this country, and in fact many applications were received from foreign trained foresters for positions in the Forestry Bureau. The Chief Forester, Gifford Pinchot, laid down the principle of "American forestry for Americans," and called on the educational institutions of the country to train American boys in the profession of forestry. He decided to delay the proper administration of the Forest Reserves until Americans could be trained for the positions. The response to his appeal was immediate and ample. In less than a decade over twenty colleges and universities offered courses for training foresters and in at least forty other institutions some education in forestry could be obtained.

The first forestry school was established at Cornell, in 1896, as an undergraduate course in forestry. The same year the Biltmore Forestry School was established on the Vanderbilt estate at Asheville. This school gave a short course, training men for the immediate work of forestry in America. The next year a graduate forestry school was established at Yale University. This was soon followed by the schools at Harvard and the University of Michigan, both of which were graduate schools.

These early schools exerted great influence on the forestry schools that were later established, since they largely furnished the faculties of these schools. These later schools, however, were mostly undergraduate forest schools, a complete course in forestry being given in four years.

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[1] Read before the Pennsylvania Section, Society of American Foresters, February 23, 1923.

Entrance to the United States Forest Service is by civil service examinations. These examinations take two days to complete and are said to be the most thorough of any examinations given by the Commission. The questions are made out by foresters already in the Government Service. These men, looking back and realizing wherein their training has been deficient, formulate questions that tend to raise the standard of work in certain courses and bring about the introduction of new courses in the curricula. These examinations set the standard for the early forestry schools.

In spite of this control the forestry schools began to diverge widely in courses taught and the weight given to different courses. This was due to inherent differences existing in the several institutions and to the natural inclination for the head of the school to favor one or another subject.

In order to bring about a more uniform development in the forestry schools of the country, Mr. Pinchot called a conference at Washington in 1910 to determine the minimum requirement of a professional forestry school. This conference outlined the courses that should be taught and the minimum credit hours that should be devoted to each. It determined that a professional forestry school should be of collegiate grade at least four years in length. This conference set the standard for the professional forestry schools for many years.

One of the results of this conference was the introduction of the five-year school. The minimum requirements adopted by the conference made it impossible for colleges requiring but fifteen or sixteen credit hours per week to complete the prescribed work in four years. The writer at the time happened to be in charge of the Forestry School at the University of Missouri. A four-year course had been outlined and put into effect. As a result of the conference a five-year course was found to be necessary and was established. The Bachelor of Science degree was granted at the end of the fourth year and the Master of Forestry degree at the end of the fifth year. It is interesting to note that no more forestry was taught at the University of Missouri in five years than was taught at the Iowa State University or the Pennsylvania State College in four years, institutions that required at that time twenty credit hours per week. At these institutions a full year of college work was gained in four years over that required by the University of Missouri in four years. The Yale School of Forestry had, previous to this time, developed a five-year course in addition to its graduate work, the first three years being in the Sheffield Scientific

School covering fundamental subjects and the last two years of graduate work in the Yale Forestry School. When the New York State College of Forestry was established at Syracuse University a five-year course was developed, probably for two reasons: first, because it was impossible to give the prescribed work in four years, and second, a natural desire to be on a par with the graduate schools and grant the degree, Master of Forestry. The Cornell School, reestablished subsequently, could not outline less than a five-year school. It is not the purpose of this article to discuss the merits of sixteen credit hours or twenty credit hours per week to be required of students, only to note that one of the great criticisms of college students today is that they acquire habits of idleness and laziness at the same time that their less fortunate brothers are putting in their eight to ten hours per day in industry. One eminent authority goes so far as to say that college students should be obliged to put in as many hours in class room and laboratory each day as a young man does who goes into business.

The original division of forest schools into four-year schools and graduate schools would have been an ideal one. After four years of undergraduate work ambitious students naturally would seek the graduate forestry schools for special training along some line that would fit them for a particular position in the forestry profession.

Following the example set by the New York schools, many others of the four-year schools added a fifth or graduate year in which special advance training might be given. These schools seem to have set the fashion in forestry education for several years. As a result the forestry schools began to diverge widely from the standard as determined in 1910. There were schools giving a complete course in forestry in four years; four-year schools that offered a graduate year for advanced study; five-year schools in which the fifth year was not essential for professional forestry training; and five-year schools in which the professional work was not completed until the end of the fifth year.

A second national conference on education in forestry was held at New Haven, Connecticut, in 1920, to discuss the question as to what extent and in what ways it might be desirable to revise the standardized curriculum of instruction in forestry as adopted at the previous conference in 1910.

This conference revised the minimum requirements for the four-year school and adopted a curriculum for the five-year professional school.

As might naturally be supposed, the question presented itself at the conference as to whether a four-year course or a five-year course should be recognized as the professional forestry school. Most of the eastern schools had developed five-year courses and naturally felt that five years should be the standard and that all schools should come to that basis for professional standing. This question was not considered for two reasons. First, because of the opposition to the plan by the western schools, most of which were four-year schools offering a fifth year of advanced study, and second, because in comparing the five-year courses with the four-year courses it was seen that in some schools (the data was used for the Penn State School), more forestry was taught in four years than was covered in five years by some of the so-called five-year schools.

A study of the catalogs of the various professional schools reveals the fact that at the present time there are but two five-year forestry schools in the country—the Yale School of Forestry, with three years at Sheffield Scientific School and two years of graduate work in the Yale Forest School, and the New York State College of Forestry at Syracuse, which states in its catalog as follows: "Graduates of the four-course will not be considered professional foresters." It would be interesting to know the standing of the graduates of this four-year course in the Society of American Foresters, which admits as members those who have had a four-year course at a forest school. The other five-year schools give the essentials of a professional forestry course in four years. The fifth year is devoted to advance courses along the lines of forestry or utilization. It looked for several years as though the professional forestry school of the future would be the five-year school, but from the present trend of development it is safe to infer that the future professional forestry school in America will be four years in length.

Another interesting development has been the introduction of special courses in the forestry schools. In the early days graduates of four-year schools sought the graduate schools for a fifth year of training and many still do so. It would have been natural to suppose that the graduate schools would have offered advanced courses to these students. But such was not the case except that Harvard University developed in the business college a graduate course in lumbering in connection with the forestry school, and for special work in silviculture, dendrology, and wood technology given at Yale. The University of Michigan ceased to be a graduate school about 1912 and became a four-

year school. Students who sought the graduate schools were obliged to repeat in large measure the work of their senior year in the four-year schools.

The profession of forestry developed rapidly in this country. The course in forestry as determined by the forestry conference and as outlined by the forestry schools was largely a special course fitting men for the general work of the Government Forest Service.

Other employers were calling for the services of trained foresters, many of them desiring a special knowledge along some particular line. Foresters were wanted by the lumber industry, by wood-using industries, by paper and pulp companies, for city forestry work, by wood preserving and distillation plants, etc. The U. S. Forest Service itself felt the need for foresters trained along special lines, such as surveying, grazing, forest entomology, forest pathology, etc. The work of forestry in this country soon became highly specialized. It was necessary for the forestry schools to keep abreast of the profession and the demand for its graduates.

The University of Washington probably was the first forestry school to introduce a specialized course, that of lumbering. The New York State College of Forestry at Syracuse soon followed, introducing courses in lumbering, wood utilization, paper and pulp, and city forestry.

This development was by many thought to be very radical and to savor of trade-school methods. The question was raised and still is being debated whether a student educated along these lines is a forestry student and is to be considered as a professional forester. But the critics of this plan were those who did not see the trend of development in the profession or failed to keep abreast of the demands of students for these lines of specialization, or the demands of industries for the products of the forestry schools. Today there are but a half dozen of the twenty odd forestry schools of the country that do not offer graduate study along one or more of these many special lines. The Yale Forestry School has recently made provision for the training of specialists in forest products, lumbering, silviculture, dendrology, and other lines of work. Advanced courses are offered to enable such specialization.

But specialization has not only been added in the graduate year of the five-year schools, but has been introduced into the four-year curricula not only of the five-year schools but also of the four-year schools. One of the questions under consideration as a result of the conference

at New Haven has been whether special courses should be given in a four-year curriculum. This has already been answered as shown by the introduction of such special courses for the following forest schools, selected at random: University of Idaho, logging engineering and grazing; University of California, logging engineering, forest products, surveying, logging, engineering, chemistry of forest products, and lumber business; University of Minnesota, commercial lumbering, forest by-products; University of Montana, forest engineering, utilization, grazing; University of Iowa, forest management, lumber marketing; Pennsylvania State College, lumbering and utilization; University of Washington, logging engineering, forest products, business of lumbering.

The introduction of specialization in the forest schools has been rapid in the last few years. The courses mentioned indicate the industries that are making demands on the forest schools for their graduates. It shows a broadening of the conception of forestry in the country from that of production of the forest crop alone, as in the early days, to include also harvesting, marketing, and utilization.

These special courses, however, are not in the nature of trade-school courses. A study of the curricula of the different forest schools reveals the fact that in every curriculum outlined for a special subject the students are required to pursue in addition to the special subjects all the courses considered essential for a training in forestry. Instead of training the specialist, the forest schools of the country are educating foresters with a special knowledge along some particular line, such as National Forest practice, lumbering, logging, entomology, pathology, wood utilization, etc. In other words, the forest schools are not only training professional foresters, but are also placing in the industries allied to forestry, a group of men who have the forestry viewpoint together with a knowledge of a special subject. Such seems to be the trend of forestry education today.

GROWTH OF SHORTLEAF PINE

(*Pinus echinata Mill*)

Planted in District of Columbia and New Jersey

By W. R. Mattoon

Forest Examiner, U. S. Forest Service

The rate of growth of planted shortleaf pine is indicated by that of some trees planted in Rock Creek Park, District of Columbia, nine years ago. In March, 1913, some 2-year-old seedlings were lifted from an abandoned field in the upper Piedmont region of South Carolina and sent by parcel post to Washington and thereafter planted in Rock Creek Park. They were spaced about 6 feet apart each way. At the same time, a like number of 7-year-old, *wood-grown* seedlings were lifted, sent along, and planted close beside the above *open-field-grown* pines. The former were mostly 8 to 12 inches in height, spindling, and crowned with a loose head of small leaves. The field-grown seedlings had short sturdy stems and compact or bunchy tops of long well-developed leaves. The situation was near the base of a southeast-facing slope on well-drained open pasture land.

In November, 1924, at an age of 11 years, the trees from the field-grown seedlings measured mostly from 14 to 16 feet in height and from 3.5 to 4 inches in diameter at breast height. They were healthy and had apparently never suffered from disease or insect attack. The woods-grown seedlings, however, had never grown appreciably, and after an existence of some 3 or 4 years had all died. Whether the trees became affected with disease or insect attack is not known. The field-grown seedlings started healthy growth in the first season planted. These facts furnish clear evidence of the desirability of using only well-developed vigorous stock. In this connection, it is of interest that in the spring of 1912 1,000 shortleaf pines were planted in New Jersey. They were purchased from a private southern nurseryman (since gone out of the business) who represented them as 3-year-old transplants; but an examination by the writer in 1913 showed that they were 7-year-old woods-pulled stock, apparently identical in size and development with those above described. The plantation proved a complete failure.

Some white pines planted at about the same time (1912) in Rock Creek Park had grown somewhat faster than the shortleaf pine, but was dying back at the tips as the result of severe attack of the white pine bark louse. Among some 40 other species of native conifers none had equalled shortleaf pine in height growth and only one, European larch, had excelled it. The measurements of the shortleaf pines, taken in November, 1921, when 11 years old, showed the following heights and breast-high diameters:

Tree No.	Total height, feet[a]	Diameter (breast high), inches	Tree No.	Total height, feet[a]	Diameter (breast high), inches
1	16	3.7	6	14	2.8
2	16	3.4	7	12	3.7
3	15	4.0	8	10	1.5
4	15	3.6			
5	15	3.7	Average	14.1 feet	3.3 inches

[a] Height measured with 10-foot pole.

Over the Piedmont region from Maryland to Alabama and in the corresponding sections of eastern Kentucky and Tennessee and the Arkansas-Oklahoma-Texas hilly region, shortleaf pine offers good—possibly the best—promise of financial returns from forest management.

REVIEWS

Forest Fires in California, 1911-1920: An Analytical Study. By S. B. Show and E. I. Kotok. U. S. Department of Agriculture Department Circular 243, contributed by the Forest Service. Issued February, 1923.

This analytical study by Show and Kotok marks a distinct advance in the handling of forest fire statistics and is a credit to the authors, to District 5 (California District), and to the Forest Service.

The work is a study of methods gauged by the results of statistics and a study of the application of these statistics in determining the administrative fire organization. The data comprise reports for not less than 10,499 fires from 1911 to 1920, inclusive, in the 12 timbered National Forests of California. Although the authors modestly state that the study is local in scope, yet the methods they have originated and evolved have wide-spread application to all of the National Forest districts and to State and private cooperative fire organizations of importance. The data contained in the circular should be studied by every instructor and student of fire protection.

The early years of fire protection in California were essentially an individualistic period; the end of this period was signalled by an excellent critical study by DuBois, entitled "Systematic Fire Protection in the California Forests," which was the first ambitious attempt to put down the details of fire protection in black and white. Following this initial period, an attempt was made to cut down the cost of prevention and suppression, and in the light of the present critical study it appears that the retrenchment went so far that the damage was unduly increased. The so-called economic theory for fire protection aims at keeping the cost of prevention, suppression, and damage to a minimum, and resulted in the cutting down of the protective force below the limits of safety. According to Show and Kotok the economic theory of protection has three grave weaknesses: "(1) The difficulty of appraising the true ultimate damage caused by forest fire; (2) the danger that any fires, unless attacked with utmost vigor, may become a disaster; and (3) the risk that any relaxation in the speed and vigor of assault on fires may have a bad effect on discipline. Even if the theory were sound the Forest Service could not, on the one hand, urge

on the public the utmost care with fire and, on the other, condemn itself for failing to follow its own preaching. It is obvious that the element of damage is not controllable at will and that it does not necessarily increase in a mere arithmetical ratio as protective effort is reduced."

The underlying theory of the Show and Kotok statistical study is that the criterion of successful fire protection is the minimum of class "C" fires (over 10 acres in area). They hold "that successful protection consists not in putting out big fires, but in catching the fires when they are small. . . . If C fires can be held to about 15 per cent of the total number of fires then the burned area per year will be a very small part of the total forest area. These facts clearly point out the danger of any policy of protection that emphasizes low cost as the main object. . . ."

The authors have compiled general statistics summarizing the results during the period and critical analyses of lightning fires, camper fires, incendiary fires, and other man-caused fires. These detailed statistics are analyzed according to concentration, intensity, annual variation, seasonable distribution, summary, etc. Factors of climate, actual damage, cost of suppression, elapsed time, and breaks are also discussed in great detail.

After the general subject of fire protection comes data from the Shasta Forest showing the need for local studies which illustrate how fire zones, relative hazard, adequacy of detection, efficiency of lookout men, the placing of suppression force, etc., can be gauged by the results of past protection.

The appendix contains definitions, examples of fire report forms, and a mass of tabular information; the body of the report is illustrated by not less than 7 maps and 33 figures. To give the reader an idea of the immense amount of work which the study involved, I hazard a guess that in time and expenses the work means, directly or indirectly, an expenditure of least $10,000 to $15,000.

The authors summarize (pages 58-60): "The development of successful protection depends on a critical study of past performances. . . . A careful analysis of fires from different causes shows that each group, based on cause, has special characteristics in seasonal distribution, location, and manner of occurrence, as well as in the rate of spread and difficulty of control as expressed in percentage of C's.

. . . Local studies (that is, studies of individual forests) based on past performance and following the principles discussed in this circular, point the way to the best use of existing means of protection, after isolating the relative needs of the various smaller protection units. . . . The determination of relative areas of hazard on different forests and for fires of different causes is an essential step in analyzing fire problems, particularly as it affects the allotment of protection funds. . . . Successful protection is reached at the point where the cost of prevention, suppression and damage is a minimum. . . . With not over 15 per cent of class C fires, a small area burned may be expected. . . . The percentage of C fires, other things being equal, depends on the speed with which fires are attacked. . . . As a practical measure to determine how well the organization is functioning, studies of elapsed time are invaluable. . . . Stated in general terms, the major problems in fire protection are: Holding the cost of prevention, suppression, and damage to the minimum, with full weight to the element of damage. Consistency of protection—that is, preventing outbreaks in bad seasons from nullifying the results of protection through several preceding years. In practice this means developing an organization capable of handling emergencies under severe conditions. To develop this elasticity requires also the development of methods of predicting emergencies within the fire season. Critical local studies to determine the best use of available means of protection."

This study is unquestionably an epoch making advance in American forest fire protection and should be studied by all technical foresters even if they are not interested in the mechanics of modern fire protection. Show and Kotok have made the greatest contribution to fire protection than has been made in any publication in the United States.

T. S. W., Jr.

The Influence of Geographic Conditions Upon Ancient Mediterranean Stock-Raising. By Ellen Churchill Semple. Presidential address before the Association of American Geographers, Washington Meeting, Washington, 1921. Annals of the Assoc. of American Geographers, Vol. XII, pp. 3-38, 1922.

A very scholarly résumé of stock-raising by the ancients in the Mediterranean region, the author citing copiously Aristotle, Columella, Galen, Pliny, Theophrastus, Varro, Vergil, Xenophon, Plutarch, Cicero,

Herodotus, Pindar, Diodorus Siculus, Aeschylus, Strabo, Homer, Sophocles, Thucydides, Tacitus, Hesiod, Pausanias, Polybius, Horace, Cato, Martial and Arrian, as well as numerous modern commentators, and various historical books of the Old Testament.

The author traces a close parallel between the climate and topography of the Mediterranean and its economic history, more especially, of course, the stock industry. On the whole the region furnished mediocre pasturage, being best in the north and west and deteriorating toward the east and south. Various pastoral peoples who pushed their way into this region from without changed from nomadism and pastoralism to sedentary agriculture and the arts. Grazing in this region was always semi-nomadic, the mountain chains forming the summer ranges. The summer drought destroyed pasturage in the lowlands from two to six months of each year. In general the upland pastures were more adapted to sheep and goats than to cattle and horses. Pigs were raised in the moister regions of the north and west; the author feels that the religious taboo against this class of stock in the East is connected with unfitness of the range there for swine. The author takes up in considerable detail the stock history of each of the main countries in this region and relates a number of very interesting economic side-lights in the way of *obiter dicta,* notably a discussion as to the meat diet of the ancients, which apparently was largely restricted to the well-to-do, and to the interest of the landed aristocracies in the breeding of fine horses, so that the horse became associated with the nobility and gentry, a custom surviving in such modern words as "chivalry," "knight," etc. W. A. D.

PERIODICAL LITERATURE

SILVICULTURE, PROTECTION, AND EXTENSION

Tolerance of Trees

Starting with Wagner's theory that differences in tolerance of trees are due to differences in their ability to absorb and utilize light of the shorter wave-lengths, and pointing out that the most tolerant species, beech and fir, occur on limestone soils. Schubert advances the theory that it is the fluorescence of calcium salts which increases the tolerance of trees on soils containing lime. The rays from the red part of the spectrum are most favorable to assimilation and plant growth, while the ultra-violet rays either do not favor growth or actually retard it. Crystals of several calcium compounds, such as calcite, dolomite, aragonite, apatite, and wollastonite show red fluorescence, converting the short, invisible, ultra-violet rays into red rays. If it is true, as suspected, that calcium oxalate crystals, which are abundant in the foliage and bark of trees, also have red fluorescence, this will explain the greater tolerance of trees on limestone soils, and also the more thrifty growth of trees as well as of other vegetation on such soils. Moreover, Stoklasa has shown that calcium is one of the constituents of chlorophyll. Schubert suggests the desirability of botanists or foresters investigating whether calcium oxalate really does exhibit red fluorescence, as calcium carbonates and phosphates are known to do. W. N. S.

Schubert. *Über die Schattenfestigkeit der Holzarten.* Forstwiss Centralbl., 44:285-290, 1922.

Maritime Pine

After the failure of several attempts to grow maritime pine (*P. maritima* or *P. pinaster*) in the Palatinate some 65 years ago, foresters generally agreed that the species was unsuitable for use in that part of Germany, because of its susceptibility to frost-damage. Many plantations of the species which have survived, however, appear to indicate that not only was this idea wrong, but that maritime pine on very poor soils is far superior to the native *Pinus silvestris.* Results of stem analyses of average trees of the two species grown in mixture show a volume per tree of from 4 to 17 times greater with the maritime pine.

It is suggested that a frost-hardy strain may be developed by careful selection of the seed to be used in establishing further plantations.

W. N. S.

Schmidt, Andr. *Die Seekiefer (Sternkiefer. Igelföhre).* Forstwiss. Centralbl, 44:265-269, 1922.

The Nun-Moth Calamity

Beginning in 1919, Central European spruce forests have suffered greatly from depredations of the nun-moth. In Czechoslovakia, 7,000 hectares of spruce have been killed completely, on 10,800 hectares over 50 per cent of the trees were killed, on 20,000 hectares 25 to 50 per cent, and on 45,000 hectares less than 25 per cent. The infestation has spread into Bavaria, Saxony, and Silesia, and is still advancing. W. N. S.

Sch. *Die Nonnenkalamität.* Deutsch. Forstz't'g, 37:752, 1922.

Seed Production of Pines

Tests of the effect of tapping on seed-production of pine (*P. silvestris*) showed that cones of untapped trees average 50 per cent heavier and contain 44 per cent more seeds; also that the seeds from the untapped trees weigh 30 per cent more than those from tapped trees, and have a germination per cent of 82.5 as compared with 64.5 for the seeds from tapped trees. The cones, seeds, and seedlings from tapped trees differ in appearance from those produced from untapped trees. W. N. S.

Planke. *Samenerzeugung geharzter Föhren.* Forstwiss. Centralbl., 44:172-175, 1922.

Pine Culture

The author describes methods of establishing pine stands on waste lands. Where scattered seed trees were present, and the vegetation cover not too dense, satisfactory results were obtained by harrowing strips among and near them. Broadcast seeding on plowed and harrowed land was successful, as were spot-sowing in furrows and planting of cones in furrows. Broadcast seeding immediately following burning off of the brush cover was not successful, but might have been if several months' interval had elapsed, so that the ground could have absorbed moisture. Planting on shifting sands is also described, and it is stated that *Pinus banksiana* did not do as well as the native *P. silvestris.* W. N. S.

Preller. *Kiefernkultur und anderes aus der Kassubei.* Deutsch, Forstz't'g, 37:913-917, 1922.

MENSURATION, FINANCE, AND MANAGEMENT

Saxon Forest Regulation

The annual cut in Saxon state forests has just been reduced from 800,000 to 500,000 cubic meters. This was necessary in spite of the pressing demand for wood, because the forests were being overcut and the forest capital reduced. Even 800,000 cubic meters filled only a small part of Saxony's timber requirements; the paper mills alone need 1,250,000 cubic meters a year. W. N. S.

K. S. *Sächsische Wald- und Holzwirtschaft.* Deutsch. Forstz't'g, 37:538-539, 1922.

Soil Valuation and Classification—Bavarian Land Tax

In theory, land of all classes was to be taxed on the basis of its average net yield, reduced to common terms of money value. Because of the wide variation in costs, however, and the absence of reliable data on yields and costs over a period of several years, such classification was not possible. Instead, assessments were based on relative gross yields, reduced to terms of one-eighth bushels of rye. This method was applied to pasture and forest lands as well as to cultivated land. W. N. S.

Schnider. *Die Bodenbonitierung and Klassenbildung für die bayerische Grundsteuer und deren geschichtliche Entwicklung. (Soil valuation and classification for purposes of the Bavarian land tax.)* Forstwiss. Centralbl., 44:175-184; 224-232, 1922.

UTILIZATION, MARKET, AND TECHNOLOGY

Tannin Content of Douglas Fir Bark

According to American writers, Douglas fir bark contains only 4 to 5 per cent of tannin, while hemlock has 15 per cent. Several tests made by Paessler on bark from young trees grown in Bavaria (about 35 to 40 years old) showed from 10 to 13 per cent tannin, with a high sugar content. The tannin content was highest for bark free from the thick corky layer found on older trees. Sheep and goat leather tanned with this material indicated that it has properties intermediate between those of spruce and oak barks. It is suggested that extension of the area planted to Douglas fir may eventually result in a valuable source of raw material for the leather industry. W. N. S.

Paessler. *Uber den Gerbstoffgehalt der Douglasienrinde.* Forstwiss. Centralbl., 44:245-249, 1922.

Coloring of Standing Trees

After 10 years' experimentation, Reimann has developed a practical process for coloring the wood of standing trees. The coloring matter, a dilute aniline dye, is introduced near the base of the tree by means of a specially constructed borer and a 100-liter container which works by pressure of the weight of the liquid. After two days the color penetrates even to the foliage of the tree. After eight days more the tree is felled, and eight days later it is sawed up. Penetration is uniform, and the process gives promise of great economic importance. W. N. S.

K. S. Z. *Fortschritte auf dem Gebiete der Farbung stehender Bäume.* Deutsch. Forstz't'g, 37:770, 1922.

POLITICS, EDUCATION, AND LEGISLATION

State Expropriation of Private Forest

The Czechoslovakian government is to take over, on January 1, 1923, the approximately 300,000 hectares of private forests in the mountain districts near the boundaries, paying the owners pre-war values. This measure is adopted to put an end to trade between Germany and the German forest owners in Czechoslovakia, to increase the state resources, and to give the state control of a zone along its borders, for military purposes. W. N. S.

Sch. *Verstaatlichung des grossen Privatwaldbesitzes in der Tschechoslowakei.* Deutsch. Forstz't'g, 37:606, 1922.

Bavarian Reforestation Law

Land used for agriculture may be devoted to timber growing only with permission of the local officials. An owner may afforest small tracts adjoining his own forest land without a permit, but must notify the proper authorities. Permits are granted only in cases where soil, climate, or location make the land better suited for forests than for agricultural crops, or if the forest is needed for a bird refuge or for protection of slopes or watercourses. W. N. S.

Schwappach. *Das bayerische Gesetz über die Aufforstung landwirtschaftlichen Grundstücke, vom 22 December, 1921.* Deutsch. Forstz't'g, 37:532-533, 1922.

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Revue des eaux et forêts, Dec. 1922.—La reconstitution naturelle des forêts dévastées du nord, by E. Rabouille, p. 395-401; Conversions en futaie et méthode du "traitement varié," by R. Potel, p. 402-11; Les races du pin sylvestre dan le domaine des Barres, by L. Pardé, p. 412-21; Sur l'application aux terrains communaux en montagne, by C. Guyot, p. 422-4.

Schweizerische zeitschrift für forstwesen, Mar. 1923.—Windfälle im Kanton Solothurn vom 4. November 1922, p. 41-2; Die forstlichen verhältnisse des bundesstaates Oesterreich, by J. Dimitz, p. 42-54; Zur bekämpfung der maikäferplage, by H. von Mülinen, p. 54-7; Arbeits- und lohnverhältnisse im forstbetriebe der ortsgemeinde Rapperswil, by P. Helbling, p. 58-62; Der wald mit den roten und blauen und schwarzen blättern, by E. Herold, p. 62-5.

SOCIETY AFFAIRS

Report of the Treasurer for 1922 [1]

The financial condition of the Society is reflected in a balance on hand of $2,574.18, after deducting $509, which was drawn during the year from current funds and invested in Treasury Certificates for a permanent fund, created at the annual meeting, one year ago. The budget for 1923 provides for adding $500 more to the permanent fund.

Receipts

Balance on hand January 1, 1922		$1,952.64
Annual dues:		
1919	$5.00	
1920	4.00	
1921	134.38	
1922	3,125.58	
1923	41.10	
		$3,310.06
Subscriptions to Journal:		
1921, Vol. 19	$30.18	
1922, Vol. 20	2,001.52	
1923, Vol. 21	199.50	
		2,231.20
Sale of back numbers and reprints:		
Journal	$134.35	
Proceedings	54.55	
Forestry Quarterly	89.10	
Reprints	1.25	
		279.25
Advertising:		
By commercial institutions	$223.50	
By educational institutions	190.00	
		413.50
Society Pins		16.80
Miscellaneous:		
Interest on deposit	$58.08	
Refund for tables used in article	20.00	
Refund for illustrations used	15.00	
Credit by bank for check	5.00	
Sale of Dr. Fernow's books	29.25	
		127.33

[1] As in former years, Miss Helen E. Stockbridge has kept the books and accounts of the Treasurer, and furnished the data from which this report was prepared.

Special Funds:			
Contribution for emergency fund	$15.00		
Contribution for permanent fund	20.80		
Interest on bonds	7.98		
		43.78	
			6,421.92
Grand total			$8,374.56

DISBURSEMENTS

Publication and distribution of JOURNAL:			
Printing Vol. 19, No. 8		$678.45	
Printing Vol. 20, Nos. 1 to 6		3,204.40	
Line cuts and half tones		40.05	
Preparing copy and proofreading		175.00	
Postage		89.35	
Stencils		10.44	
Envelopes for mailing		135.75	
			$4,333.44
Miscellaneous printing:			
Post cards		$4.75	
Letterheads		16.25	
Lists of candidates		30.50	
Lists of members		218.75	
Nomination blanks		27.50	
Bill heads		23.00	
Ballots		9.75	
Circular letters		14.16	
Resolutions		10.00	
Programs of meeting		42.00	
			396.66
Stationary and postage (exclusive of JOURNAL):			
Stamped envelopes		$131.62	
Stamps		66.44	
			198.06
Clerical and stenographic work			208.00
Addressing envelopes and folding			18.25
Telegrams			5.97
Express			36.03
Freight			5.55
Society pins			16.80
Miscellaneous:			
Refunds on subscriptions		$22.85	
Repairs and ribbons for addressograph		1.75	
Binding set of JOURNALS		12.50	
Folders for letter files		3.50	
Envelopes for mailing membership lists		5.00	
Dr. Fernow (for sale of his books)		27.02	
			72.62
Special Funds:			
Bonds for investment and interest			509.00
Total			$5,800.38
Balance on hand			2,574.18
Grand total			$8,374.56

ASSETS

Balance on hand		$2,574.18	
Annual dues:			
22 at $5	$110.00		
21 at $4	84.00		
		194.00	
Sales of back numbers		37.95	
Advertising		82.50	
Total			$2,888.63

LIABILITIES

Advertisements paid in advance	$20.00	
Dues paid in advance	41.10	
Subscriptions paid in advance	199.50	
Clerical and stenographic work	58.75	
Printing and mailing Vol. 20, No. 7	698.81	
Printing and mailing Vol. 20, No. 8	483.12	
Preparing copy and proofreading	50.00	
Line cuts and half tones	4.00	
Stencils	5.44	
Postage, express, and telegrams	6.51	
Expenses, annual meeting, Boston	68.05	
Total		$1,635.28
Excess of assets over liabilities		$1,253.35

F. W. BESLEY, *Treasurer.*

Audited and found correct by R. V. REYNOLDS.

NEW ENGLAND SECTION

The winter meeting of the New England Section was held at New Haven, February 23. The attendance (20) was not up to the average of the Section, but our ranks were supplemented by foresters from New York, New Jersey, and Pennsylvania, who were attending the agricultural extension leaders' conference on farm forestry which was in session at the same time.

The morning session was given over to routine business and an account by Prof. Hawley of the forestry work accomplished on the holdings of the New Haven Water Company.

In the afternoon we made a trip to the Maltby Tract of the Water Company and under Hawley's guidance looked at the plantings and thinnings made here, some of them 18 years ago. Some of the older Yale graduates present saw the results of their first attempts at outdoors forestry.

The evening session was devoted to three papers: Dean Graves on "Scope and Organization of Forest Research in New England," Prof.

Woodward on "Land Management in New England and the Farm Woodlot," and Collingwood on "Farm Forestry Extension Work in New York." These papers were well worth a larger audience.

S. T. Dana was elected chairman and H. O. Cook secretary of the Section. This Section concurred in the opinion of the California Section that further changes in the botanical nomenclature of trees were not desirable.

Northern Rocky Mountain Section

The following resolutions concerning proposed changes in common or vernacular nomenclature of forest trees as contemplated by the United States Forest Service were adopted by the Northern Rocky Mountain Section of the Society of American Foresters, March 12, 1923:

Whereas, A committee has been appointed by the Forest Service to revise the common names of trees for a proposed revision of the Forest Service Check List of the Forest Trees of the United States; and

Whereas, The committee in question proposes to revise only the common or vernacular names, not the scientific names, to be published in the revised list; and

Whereas, The Committee did under date of September 7, 1922, submit a tentative list of revised common names for consideration by representative silviculturists; and

Whereas, The proposed names offered by the committee appear to be so chosen as to tend to greatly lesson existing confusion in the use of common names of forest trees; therefore, be it

Resolved, That the Northern Rocky Mountain Section of the Society of American Foresters desires to indorse the efforts of the committee as expresed by the tentative list of common names issued by them under date of September 7, 1922; and be it further

Resolved, That copies of this resolution be sent to the Forester, United States Forest Service, the President of the Society of American Foresters, the Managing Editor of the Journal of American Forestry, and the Chairmen of the Sections of the Society of American Foresters.

The Executive Council has elected Raphael Zon as Editor-in-Chief, to fill the vacancy caused by Dr. Fernow's death. The Editor-in-Chief will also be Managing Editor of the Journal of Forestry.

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